ISP203A – Global Change
Greenhouse Effect

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

Greenhouse

- Atmosphere - Nitrogen - 78
  Oxygen - 20 (methane)
  CO_2, Water Vapor, Inert Gases - 2%

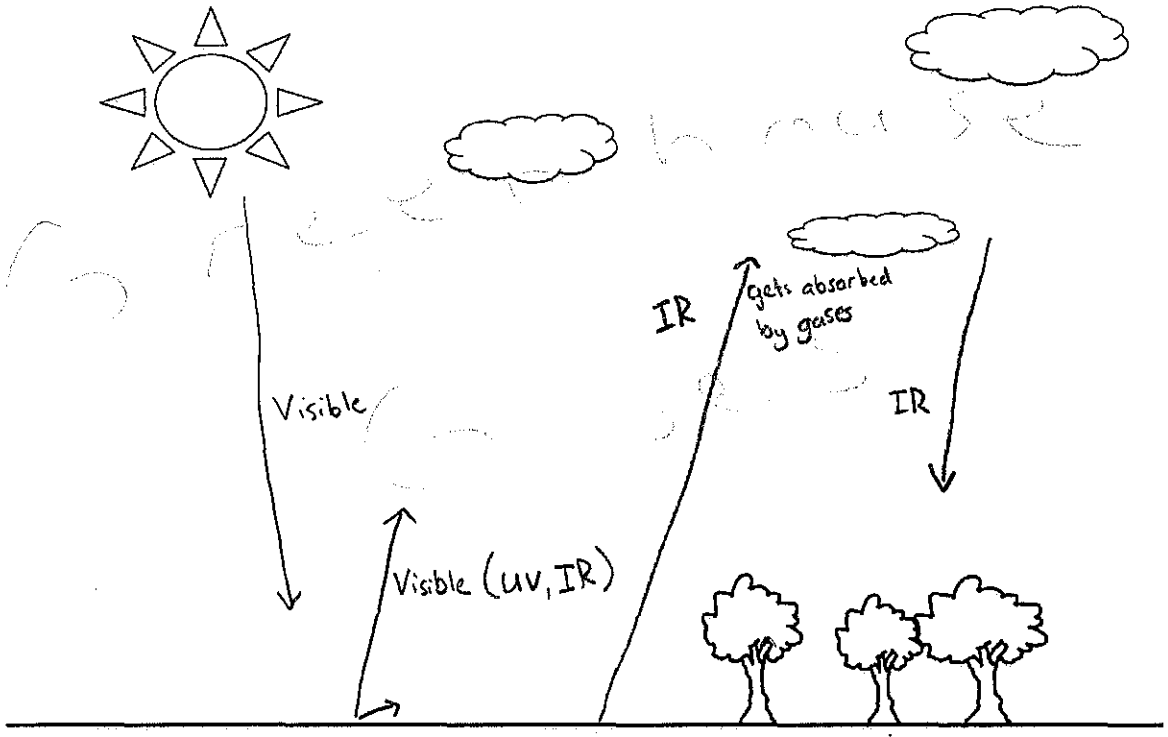
Energy Transfer - Conduction - Energy Xfer through solid materials
Convection
Radiation - Energy Xfer in the form of a wave. (Visible light)
- Infared - wavelength > 700 nm
- UV - < 400 nm
- Visible - in between

Ground and Greenhouse Gases converts short wl to long wl (heat)
- gives off infared

ISP203A – Global Change
Greenhouse Effect

GROUP #: Y
Student IDs of Members Present:
A35919773
A40491423
A42837704

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Energy from the sun is mostly visible light, with some UV and IR.
Energy absorbed by greenhouse gas is all IR.

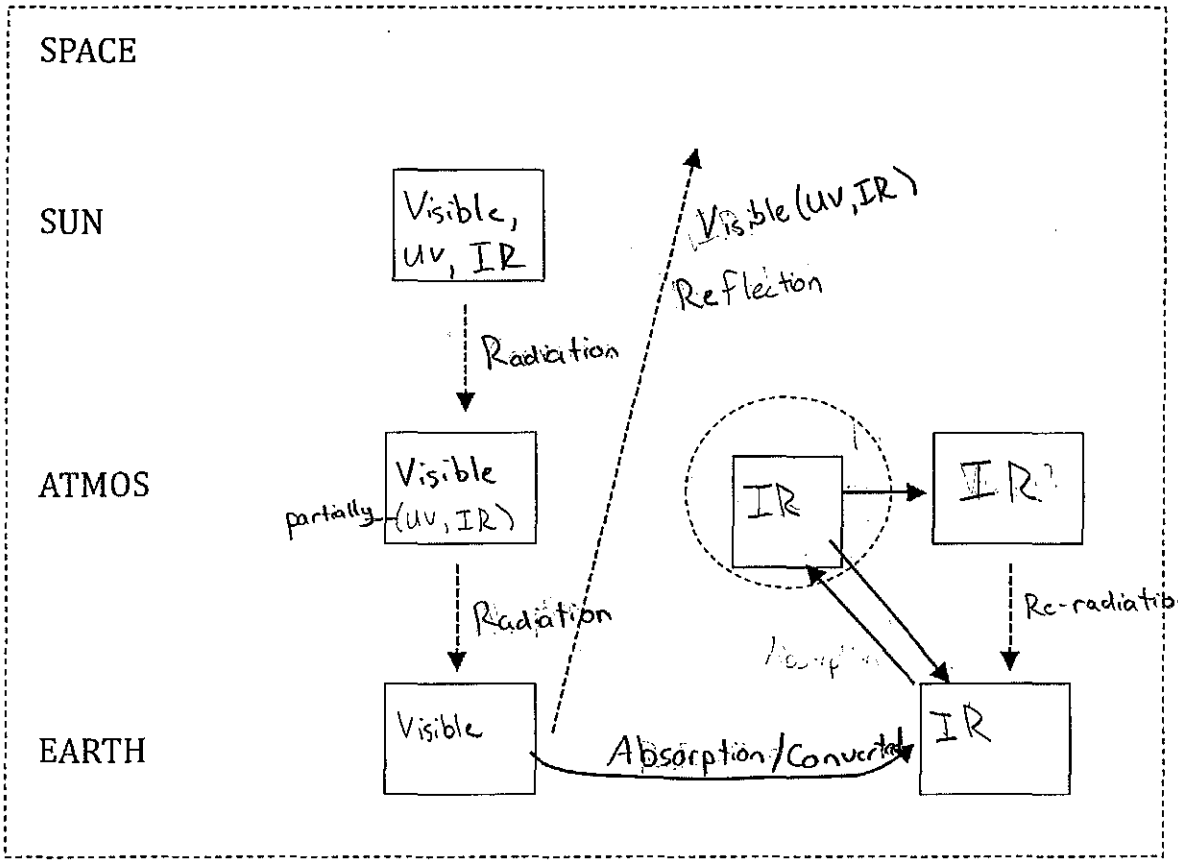
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

Energy absorbed by the surface is mostly visible
Energy emitted by the surface is mostly IR.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

It is the "same energy" only the visible and UV parts aren't absorbed.

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

The sun emits radiation in many forms. The ones that matter in this area are visible, UV, and IR. It passes through the Earth's atmosphere (ozone), where the IR and UV get mostly reflected. Then, the visible light is absorbed by the Earth's surface, and partially reflected. The absorbed radiation is then converted to Infared, where it is re-emitted back into space. However, some of the IR light is absorbed by greenhouse gases and re-radiated back into the atmosphere.

4. What would happen if the atmosphere contained no greenhouse gases?
Days would get super hot and nights would get super cold.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

Replace the glass with a magical gas which traps UV.

Part 3: Homework
If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

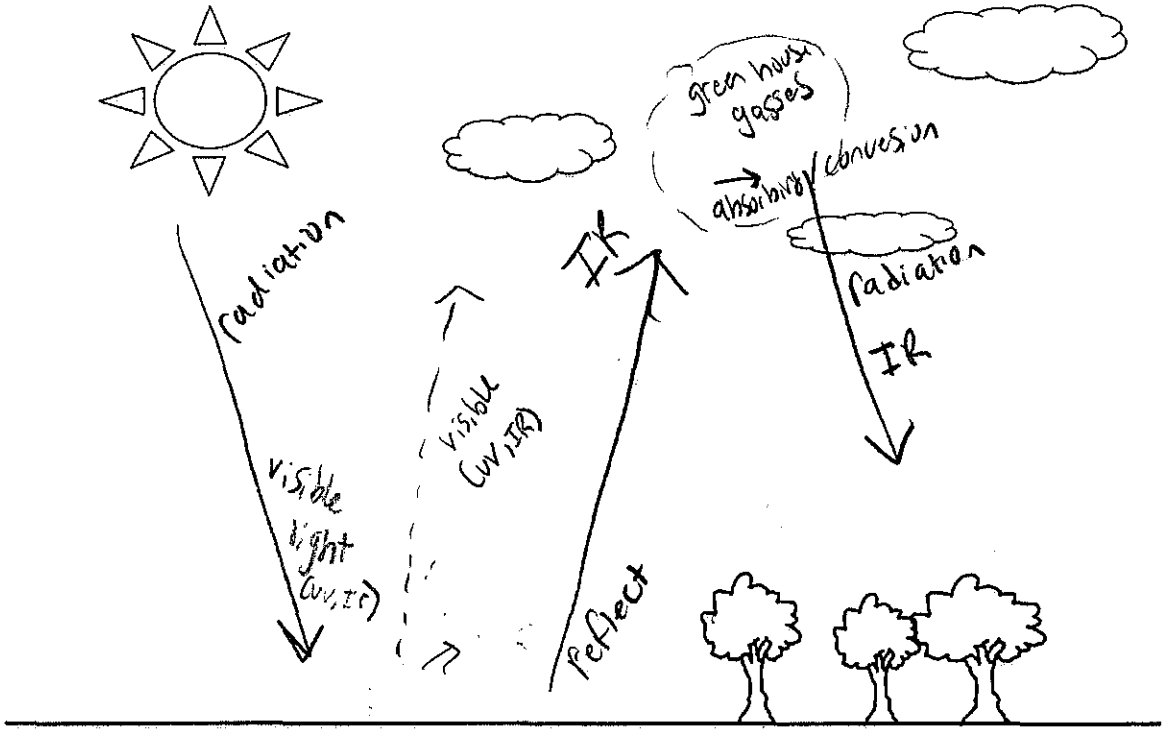
2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

GROUP #: X
Student IDs of Members Present:
A43012134
A43398594
A31630993

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Both have IR which is heat that warms the atmosphere.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

Earth absorbs visible light and emits IR

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The earth is emitting IR which is what the green house gasses absorb.

ISP203A – Global Change
Greenhouse Effect

X

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
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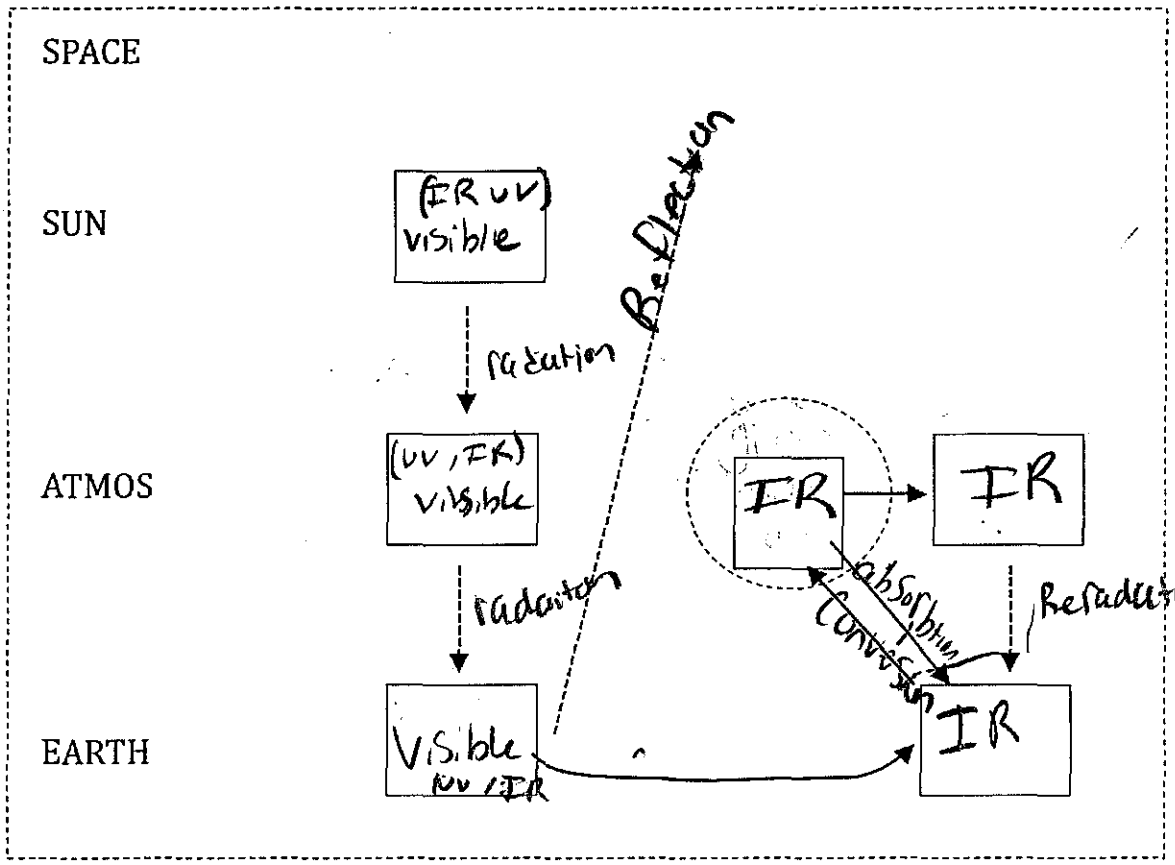


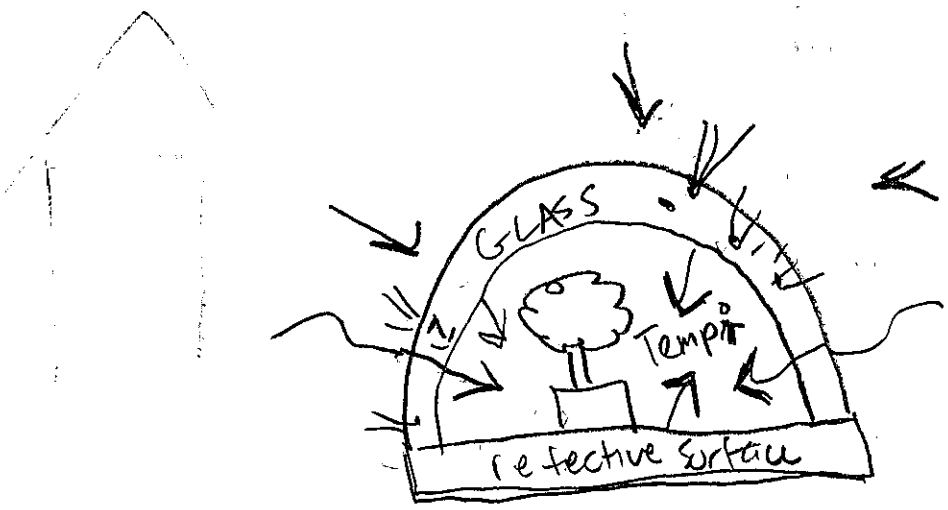
3. Write a complete explanation of the greenhouse effect process in words.

The greenhouse allows in visible light and traps in infared. The gases absorb the heat and reradiate energy back. The energy from the sun is trapped in like a greenhouse.

4. What would happen if the atmosphere contained no greenhouse gases?

It would be really hot in day and cold at night.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

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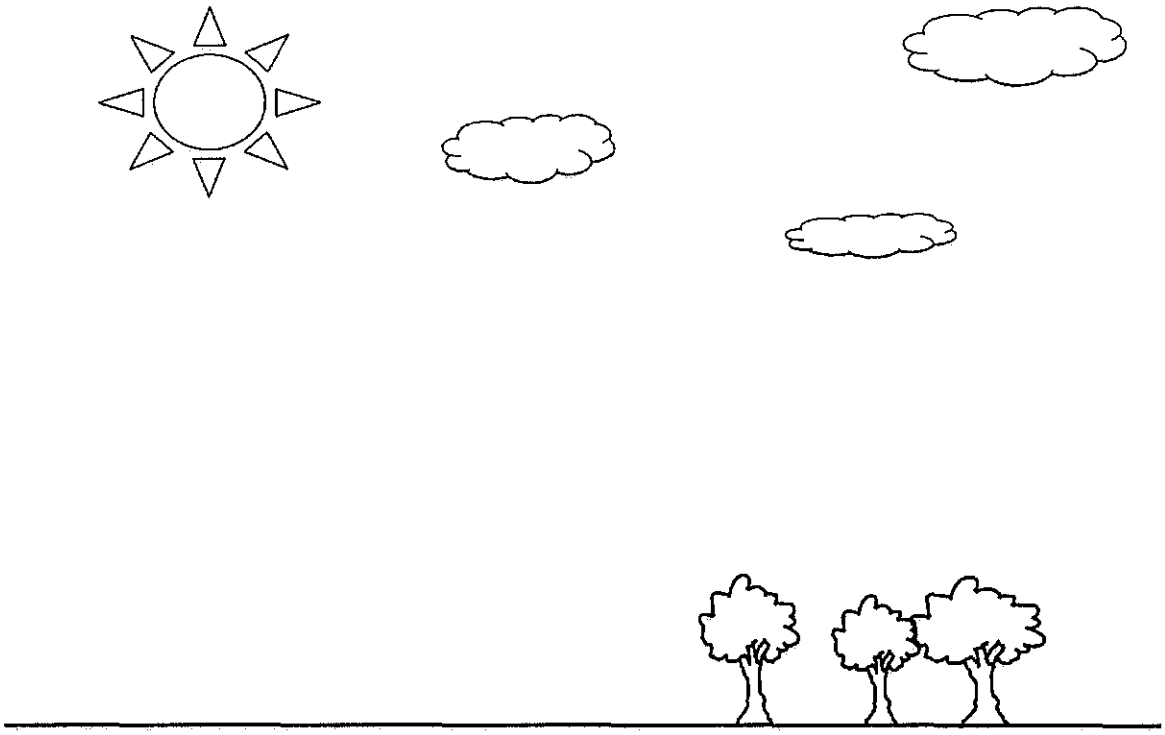
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #:
Student IDs of Members Present:

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



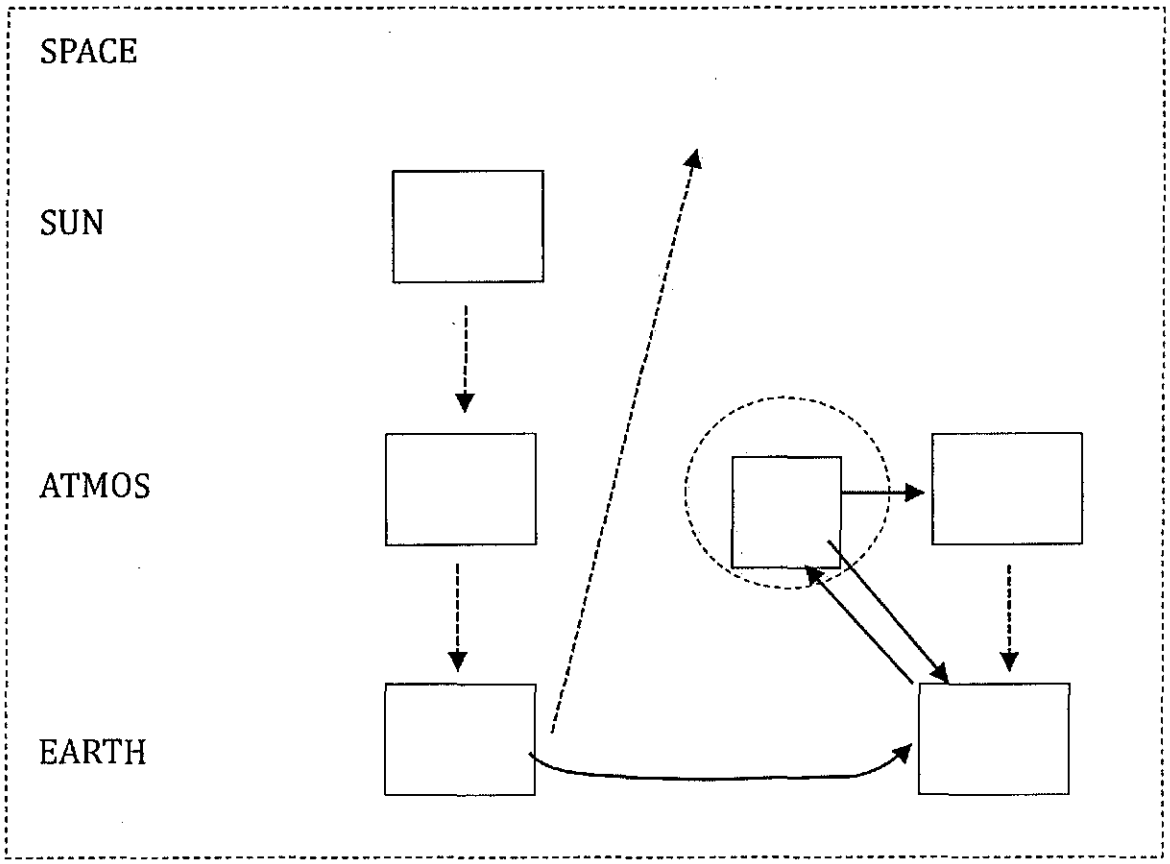
Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

4. What would happen if the atmosphere contained no greenhouse gases?

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

Part 3: Homework

If you complete the group work, you may work on the homework **on your own.** This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

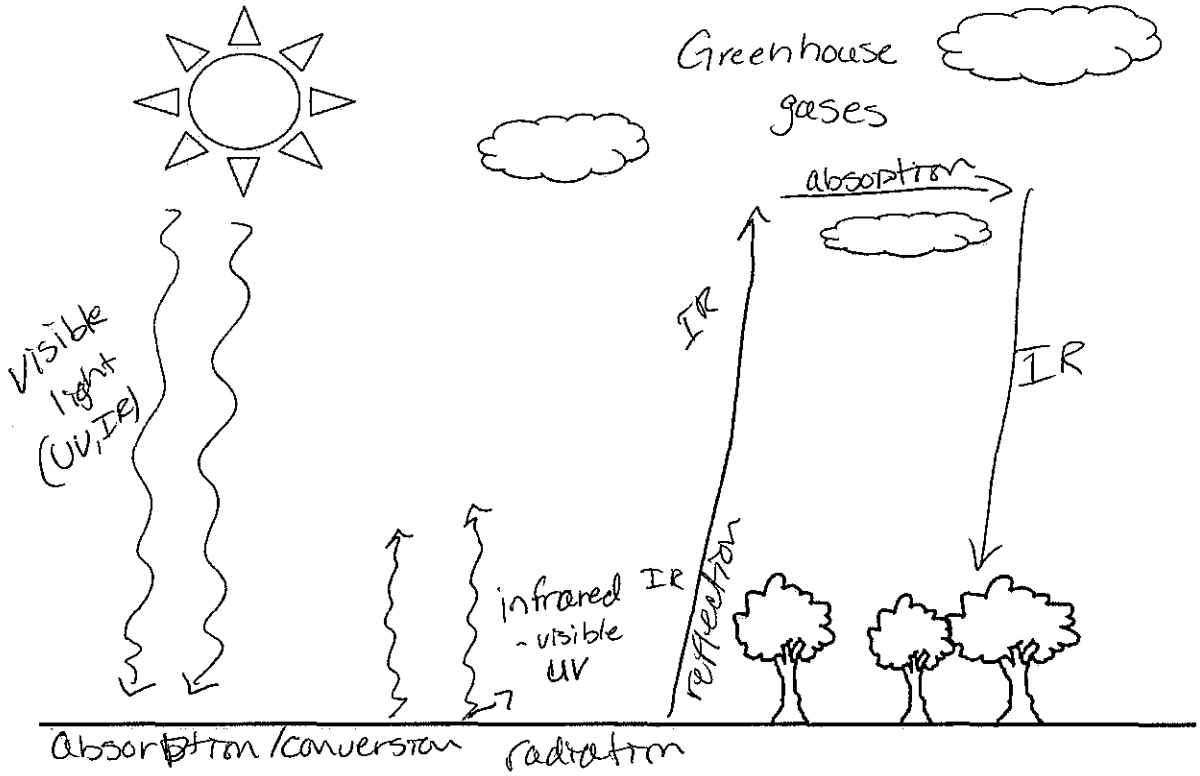
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #:
Student IDs of Members Present:
A39737915
A44013916
A39743811
A42185423

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



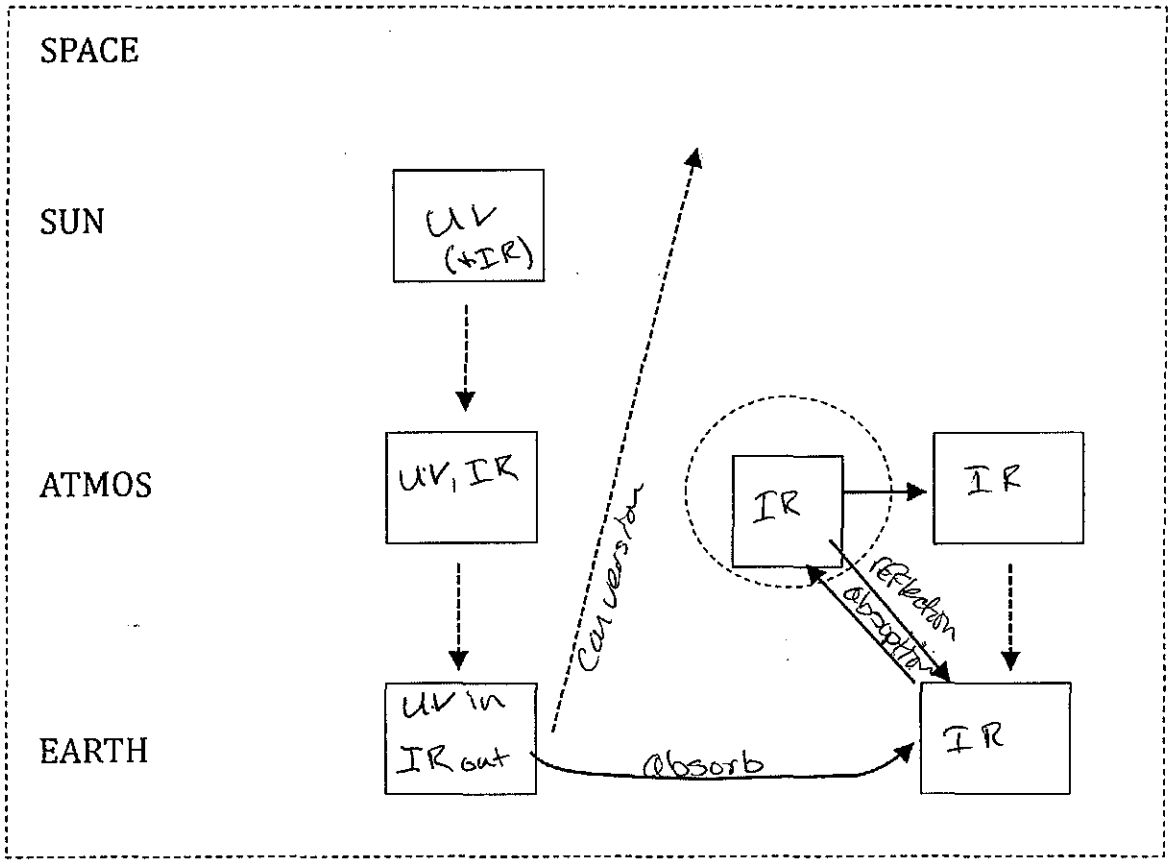
Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?
energy from the sun is mostly visible light, while energy absorbed by greenhouse gases is mostly infrared (heat). Both energies get absorbed and go through radiation.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?
energy absorbed is mainly visible, while energy ~~is emit~~ emitted by the surface is mainly infrared heat. Both go through absorption + radiation.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?
energy that is emitted by Earth's surface is the same energy that is absorbed by greenhouse gases. It is the energy that is absorbed + then converted + then emitted by the surface

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**

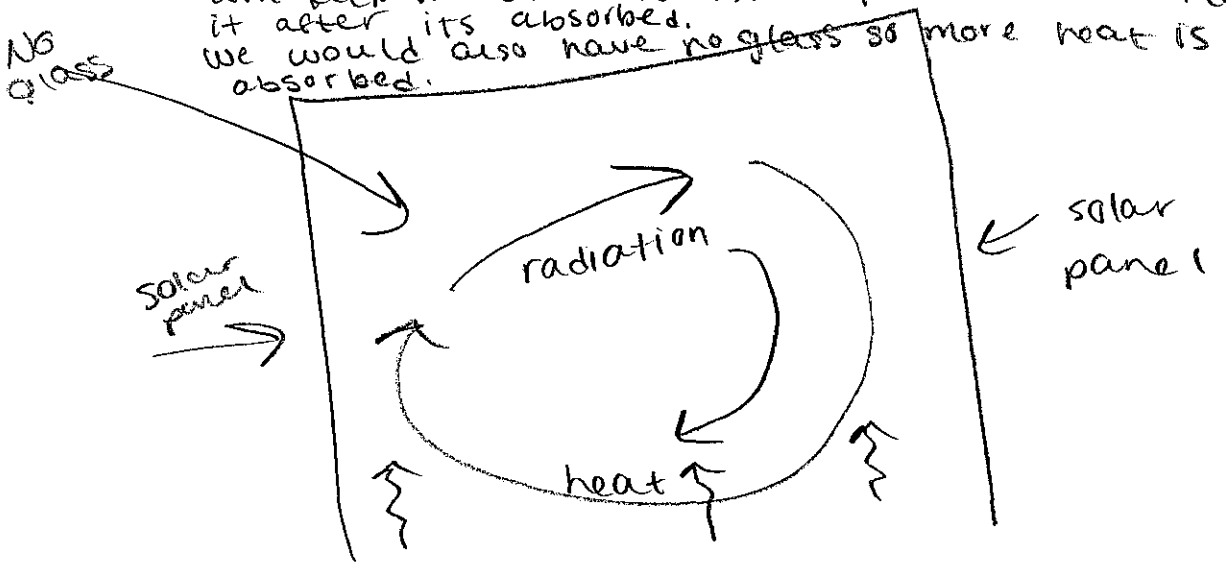


3. Write a complete explanation of the greenhouse effect process in words.

Sun gives off visible light, ~~the earth~~ some goes into the Earth's atmosphere ~~some is absorbed~~ & then travels to the surface, some is reflected & some is absorbed & converted into heat. the heat is then trapped by the Greenhouse gases: water vapor, methane, & carbon dioxide, creating the Greenhouse effect.

4. What would happen if the atmosphere contained no greenhouse gases?
The temperature range would be extreme, from very hot to very cold, from day to night. ~~It~~ life as we know know it would not exist. Life on our Earth requires temperature consistency.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.
- redesign it so that there is more circulation of the heat when it is absorbed. The circulation will keep the area warmer instead of reflecting it after its absorbed.
We would also have no glass so more heat is absorbed.



Part 3: Homework
If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL**.

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

5

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

Solar energy has short wavelength

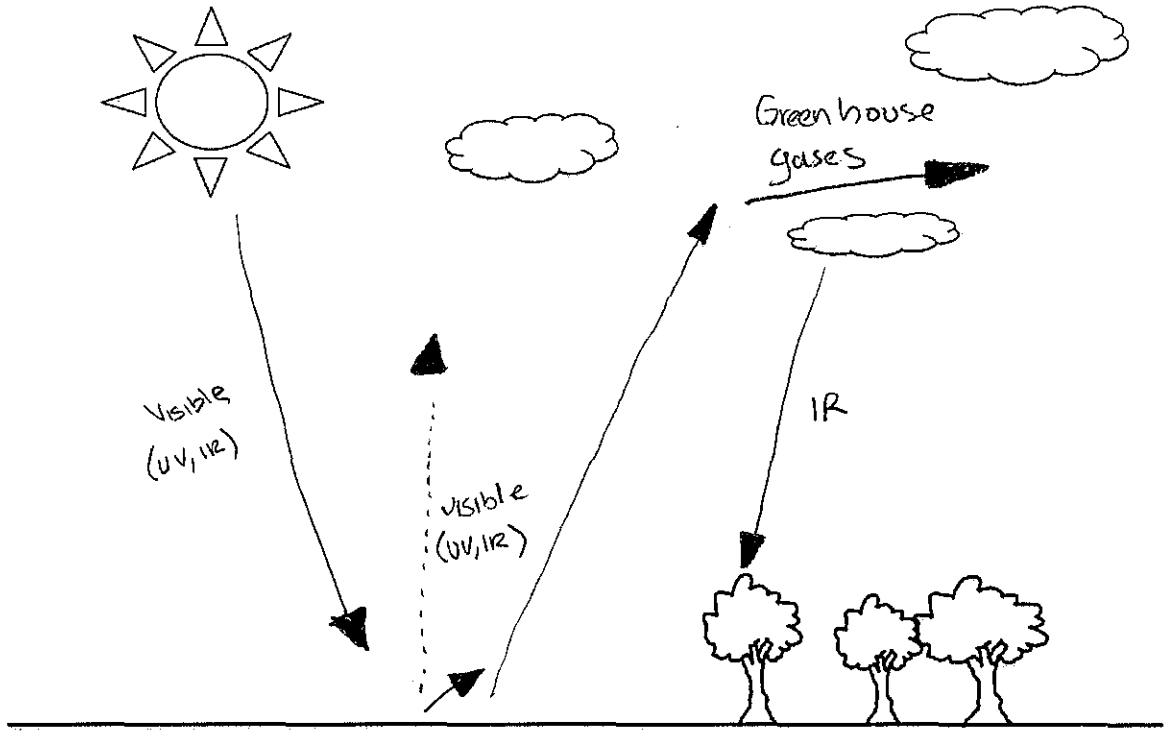
-absorb by earth surface & release to atmosphere to infrared radiation.

- Gases (CO_2, methal, water vapor) absorb radiation

ISP203A – Global Change
Greenhouse Effect

GROUP #: 5
Student IDs of Members Present:
A43292970 A13927449
A43294133
A43856550

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Energy coming from the sun is mostly visible with a little bit of UV and Infrared. The energy absorbed by the greenhouses gases is just IR.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

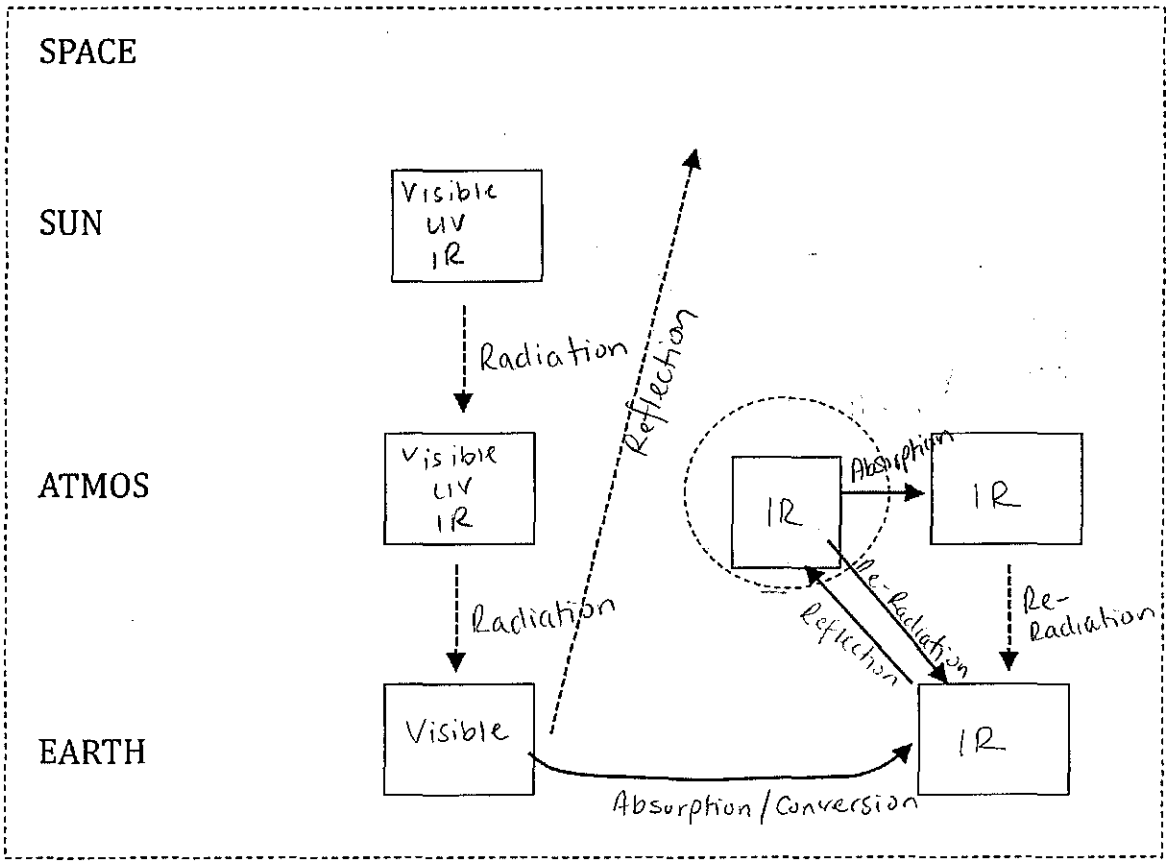
The energies are different because the Earth's surface absorbs visible light and emits it as IR.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The Earth's surface emits IR and the greenhouse gases absorb it as IR too.

5

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

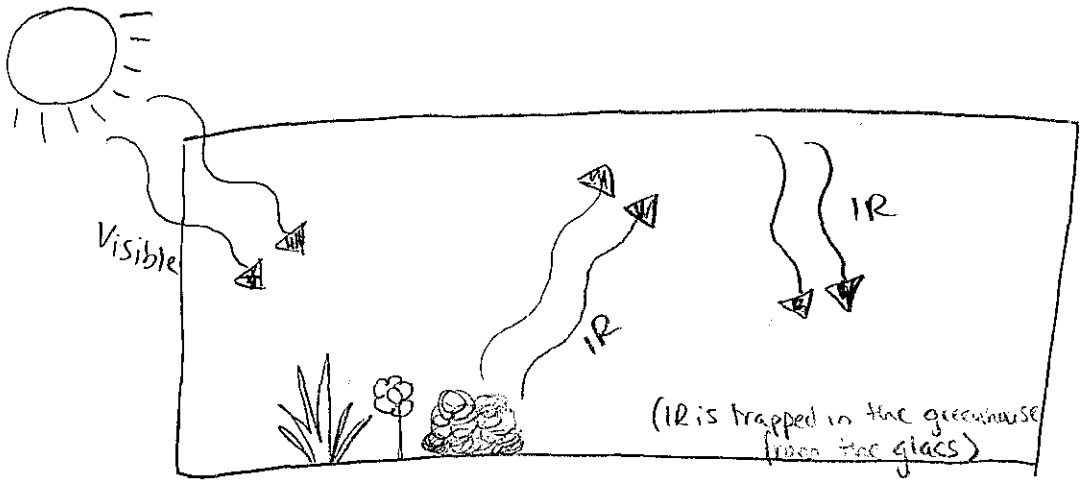
The Sun emits energy and the visible light reaches the surface. The visible light is absorbed by the surface and converted to IR. IR is emitted back into the atmosphere. Greenhouse gases absorb the IR and re-emit it into the atmosphere.

5

4. What would happen if the atmosphere contained no greenhouse gases?

There would be no greenhouse effect and humans could not exist because heat could not be trapped.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

R

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

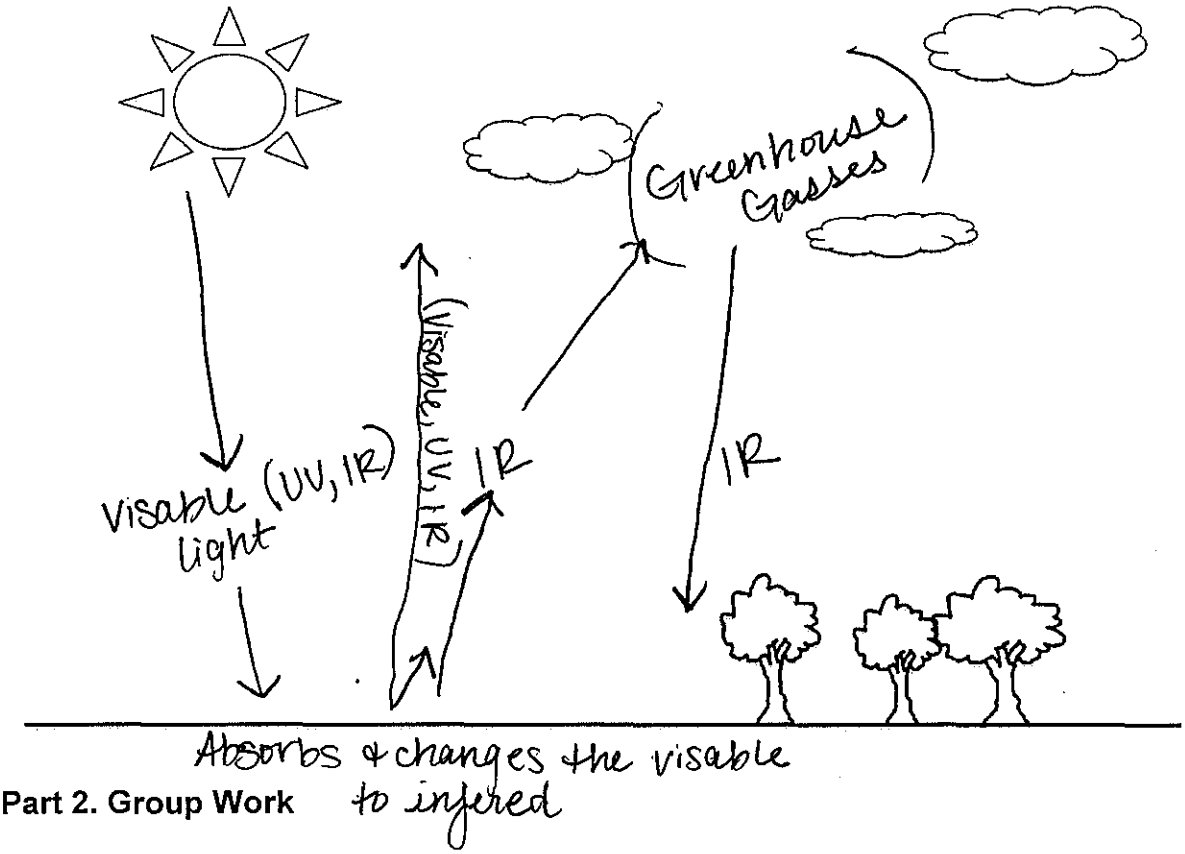
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #: R
Student IDs of Members Present:
A39979824, A40711436,
A40688630, A40994271

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The sun gives off mainly visable light as well as UV & IR. The energy absorbed by the greenhouse gasses is Infared.

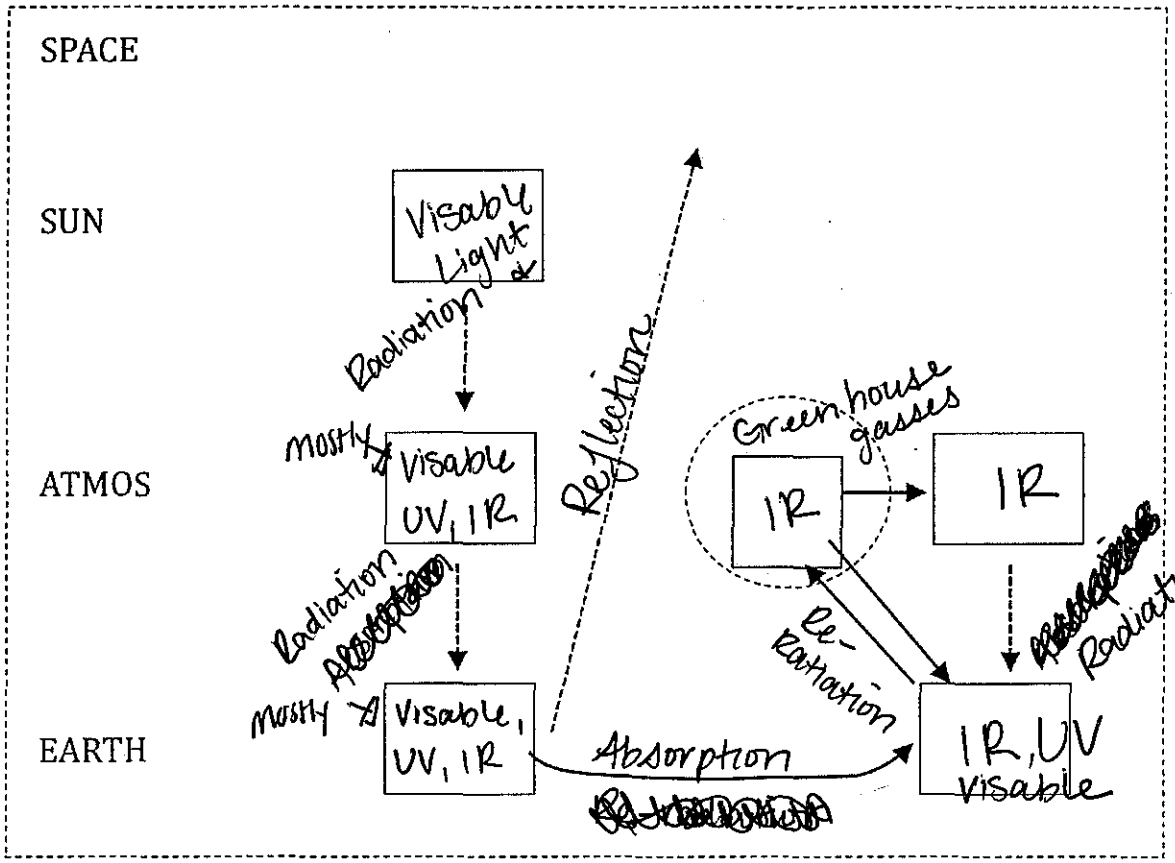
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

The energy absorbed by Earth's surface is different from the energy that is emitted by Earth's surface because the Earth absorbs visable light & turns it into infared.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

Energy emitted by the Earth's surface is different because the earth emits visable, UV, & IR while the green house gasses only absorb IR.

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

Process where energy from the sun penetrates into the lower atmosphere & onto the surface of Earth & is converted to heat but the cannot leave the planet.

Suns Radiation → absorbed by Earth → some re-radiated to space as heat → some trapped by atmosphere

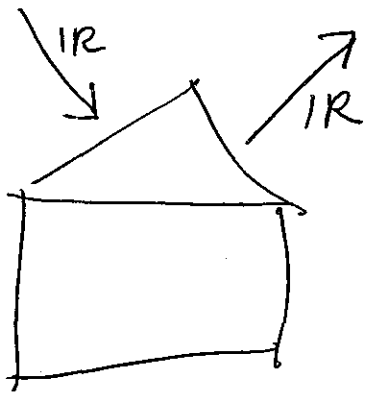
R

4. What would happen if the atmosphere contained no greenhouse gases?

Humans would not exist as we are. It would be extremely hot during the day & freezing cold at night. We would be unable to supply food for ourselves as well as survive with out adequate accomidations.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

* Design a greenhouse that allows the IR to return back into the atmosphere rather than trapping it inside the greenhouse forever.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL**.

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

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1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

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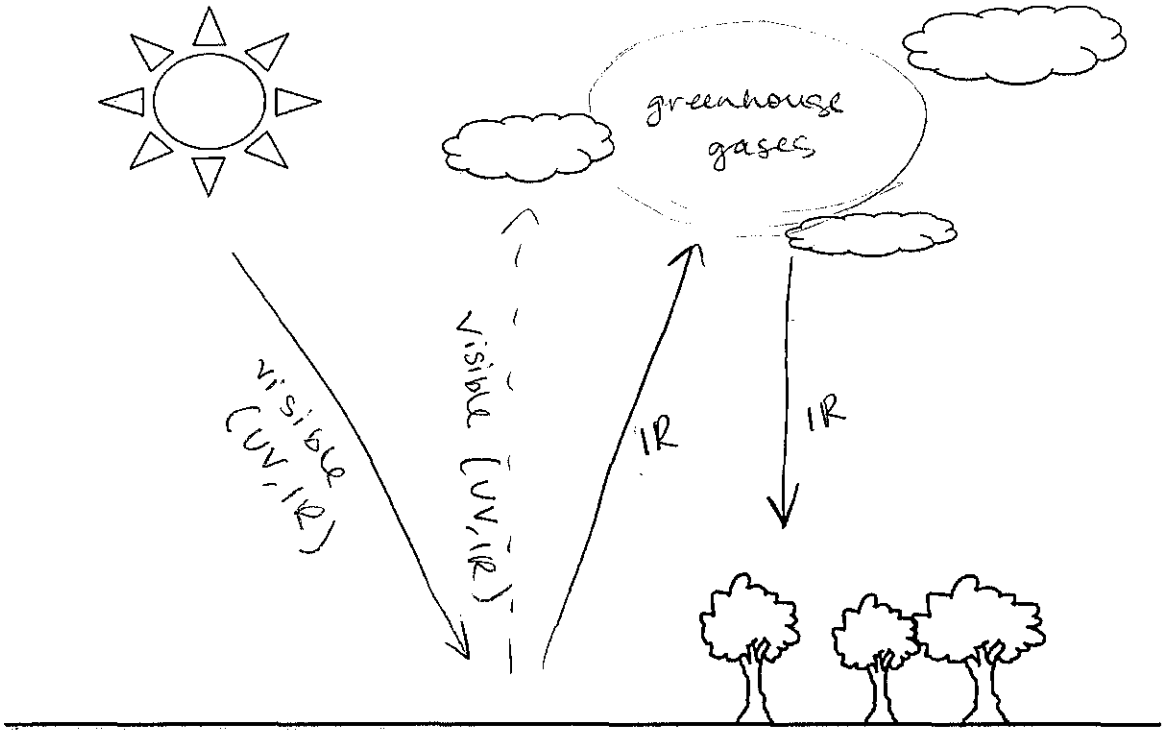
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #:
Student IDs of Members Present:
A43628897, A43414990, A43143418

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The Sun emits UV and IR energy but the greenhouse absorbs only IR.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

Earth absorbs visible light in short waves and gives off infared long waves.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

Both infrared.

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
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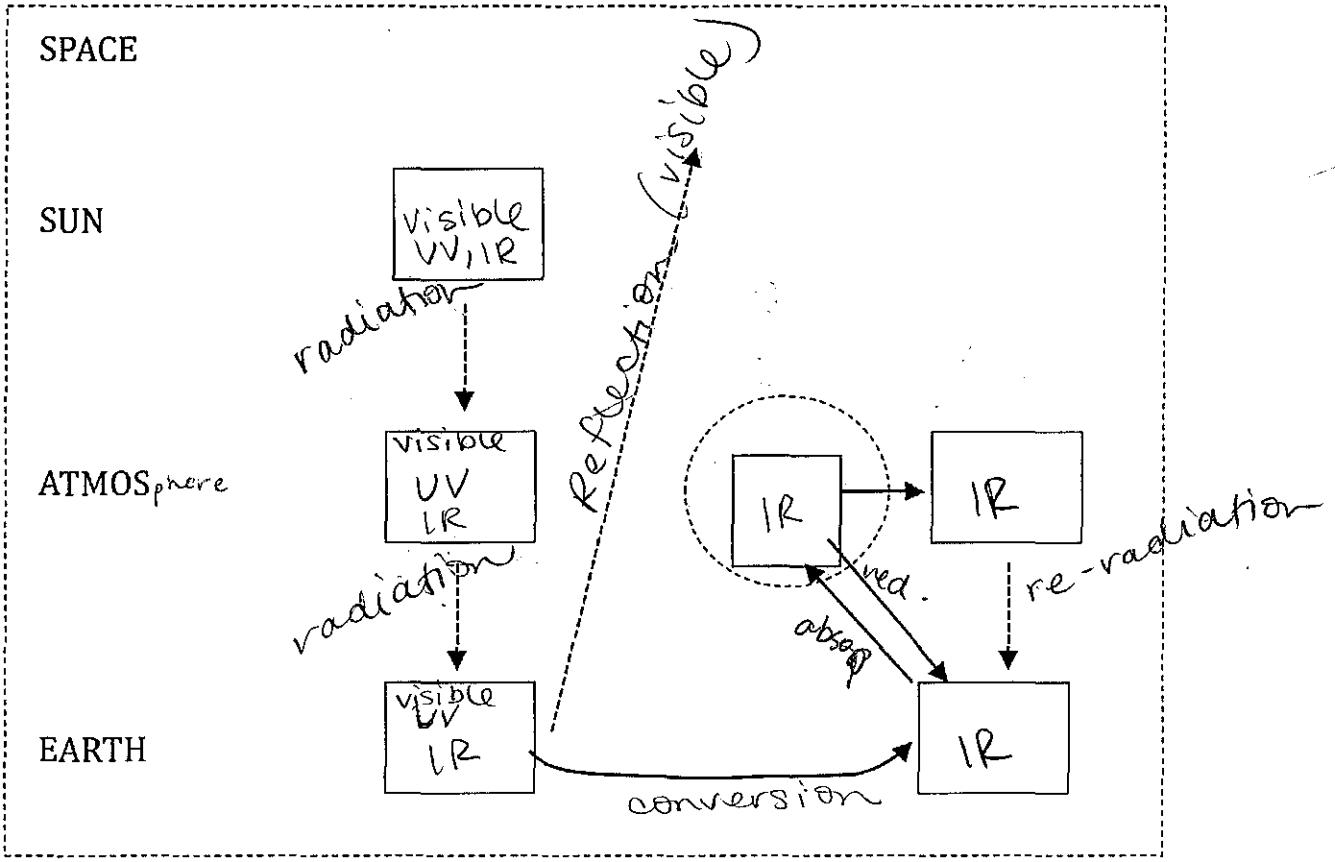


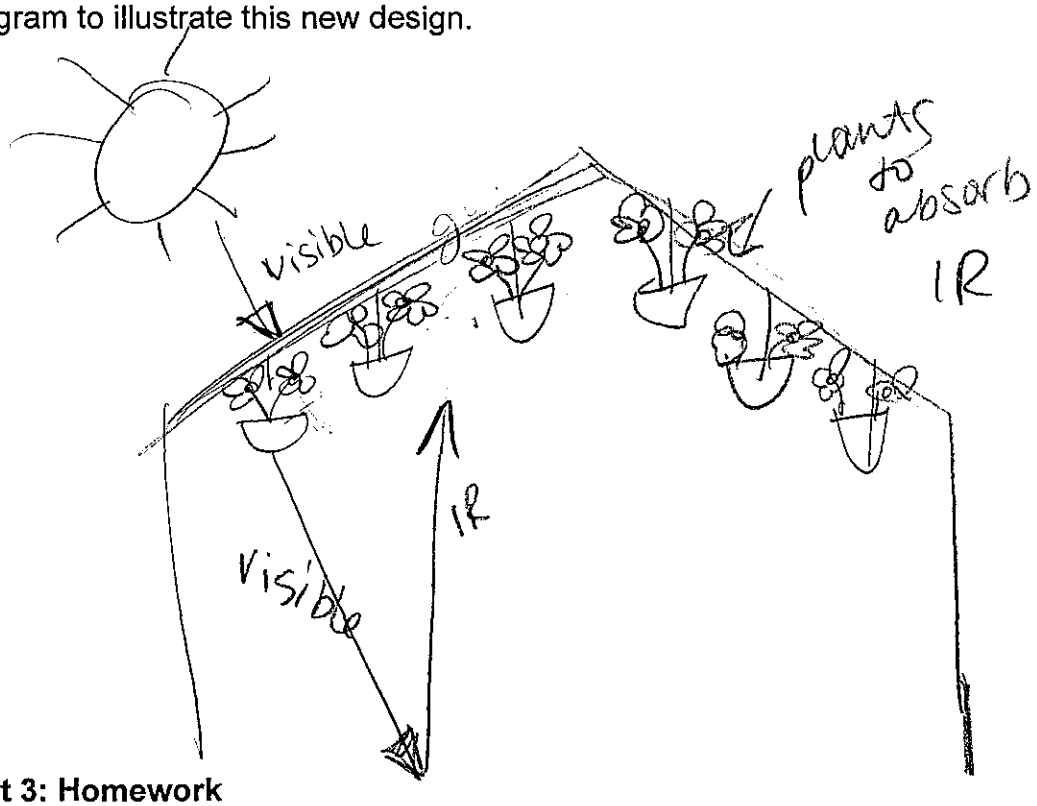
3. Write a complete explanation of the greenhouse effect process in words.

visible light reaches Earth and is absorbed. Earth emits infrared and reflects some visible light

4. What would happen if the atmosphere contained no greenhouse gases?

It would be cold because the greenhouse gases trap the heat.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

into the atmosphere & escape.

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

it would increase.

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

It could be because it's trapping all the heat in the atmosphere and making the Earth's temperature warm

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

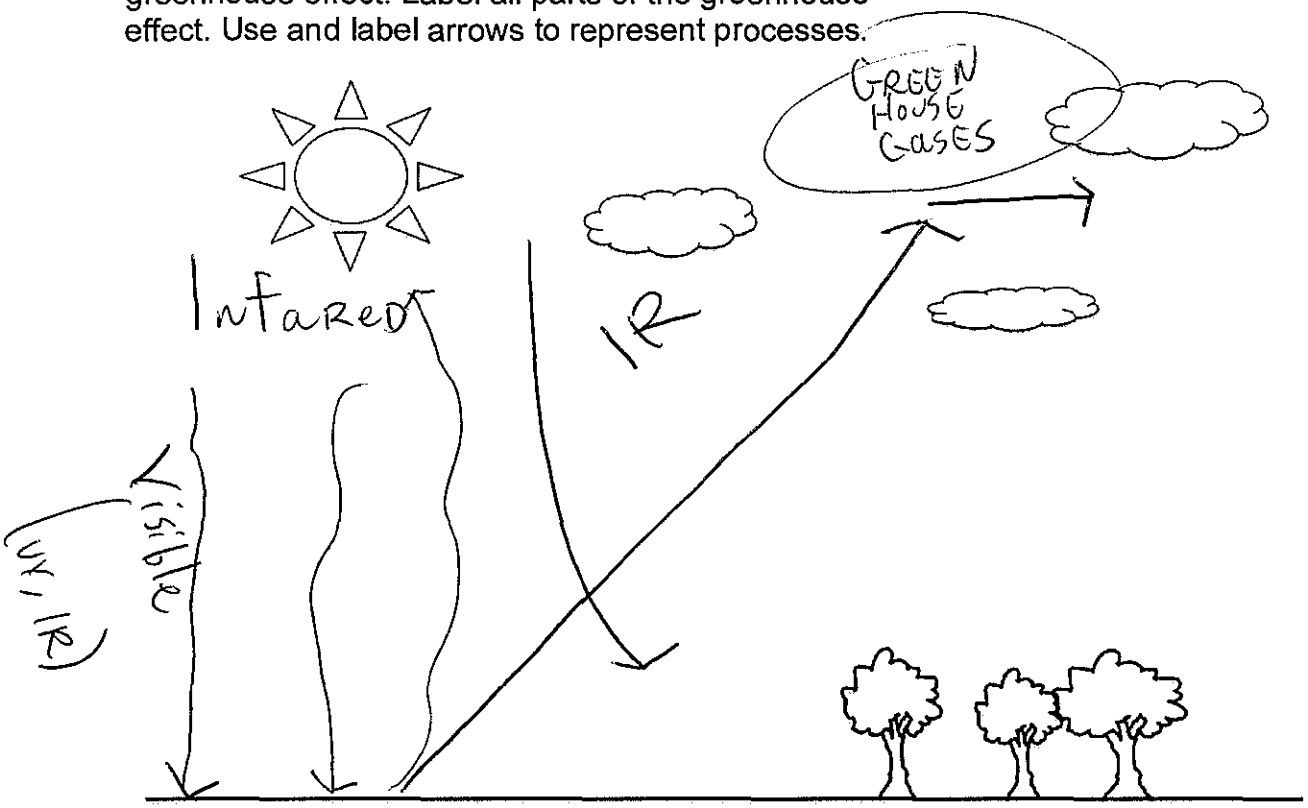
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #: P
Student IDs of Members Present:
A39800329

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The energy is similar in that infrared is absorbed by greenhouse gases in both.

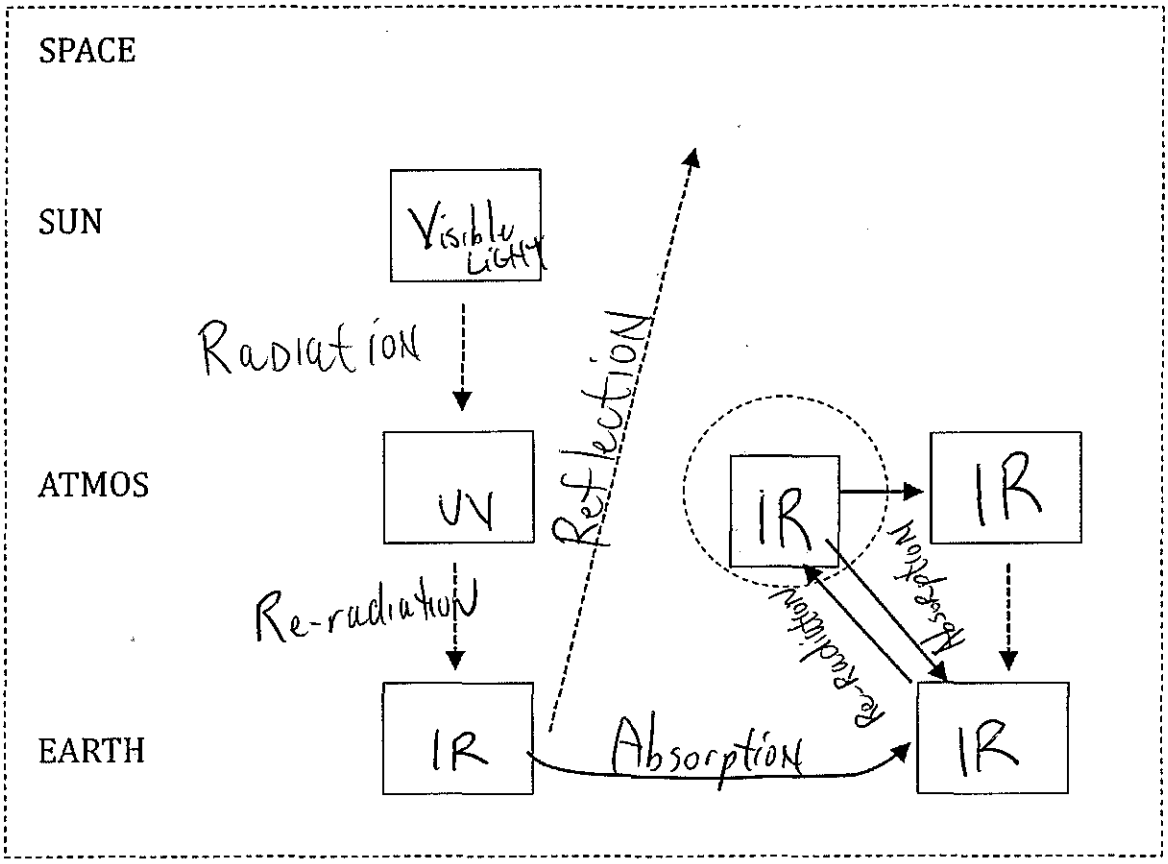
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

The energy is similar in that ultraviolet energy is absorbed by earth's surface and also emitted by earth's surface.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The energy emitted by earth's surface is absorbed and re-radiated the same way in which greenhouse gases are.

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



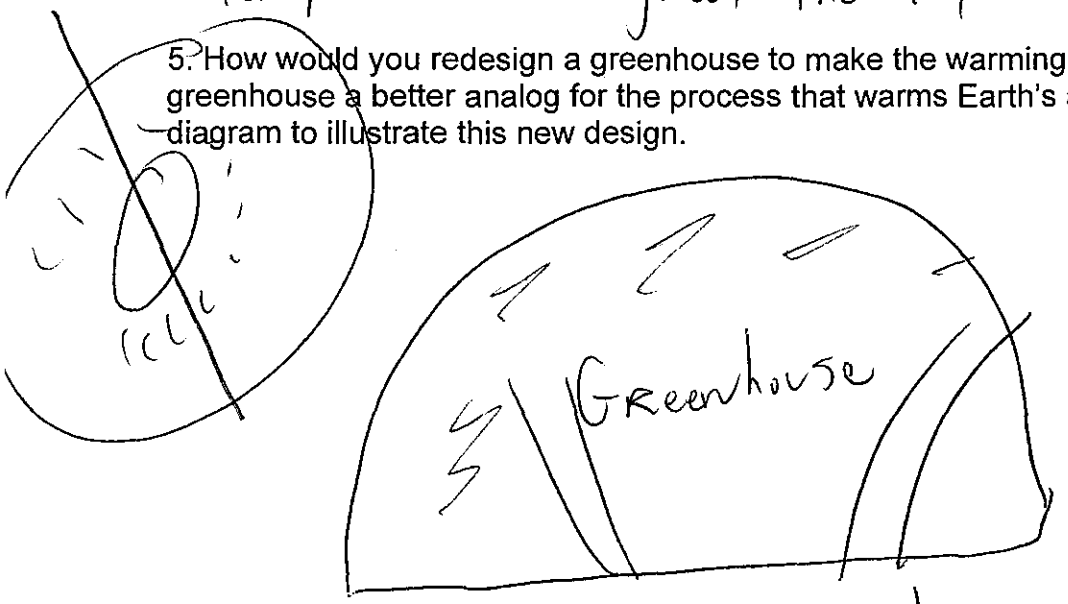
3. Write a complete explanation of the greenhouse effect process in words.

Visible light is reflected from the sun to the atmosphere through ultraviolet radiation. Then, infrared is absorbed but remains infrared and doesn't change throughout the process of re-radiation.

4. What would happen if the atmosphere contained no greenhouse gases?

This would cause extreme changes in temperature throughout the day and night.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Energy stems from inside due to unpredictability of the sun (too powerful, often).

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL**.

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

Greenhouse Effect:
- involves the sun
- traps the heat
- CO_2
- Plants
- long waves vs. short waves

gases in atmosphere
Nitrogen 78%
Oxygen 20%
CO_2 .03%
inert gases (methane) CH_4 .97%
water vapor 1%

Radiation
- energy transferred by electromagnetic waves
light = heat

convection
heat energy transferred in liquids & gases by movement of matter. (circulation of heat)

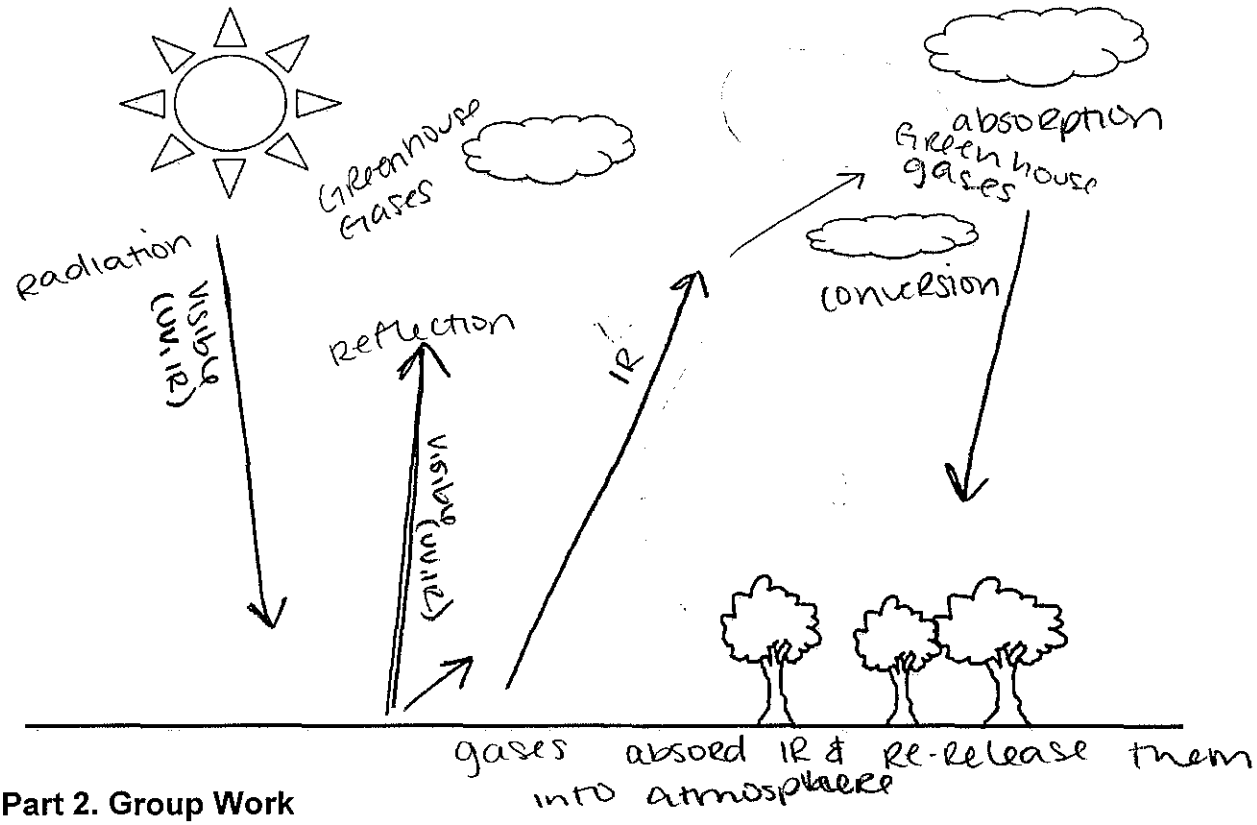
conduction
heat transferred by atoms/molecules coming in direct contact w/ another

Thermal = heat = infrared
Radiation
infrared = energy w/ wavelengths above 700 nanometers
Ultraviolet = energy w/ wavelengths below 400 nanometers
different materials allow different lights to go through them

ISP203A – Global Change
Greenhouse Effect

GROUP #: ○
Student IDs of Members Present:
A41262816
A43643320
A34590917

Radiation, Reflection, Absorption/Conversion
On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

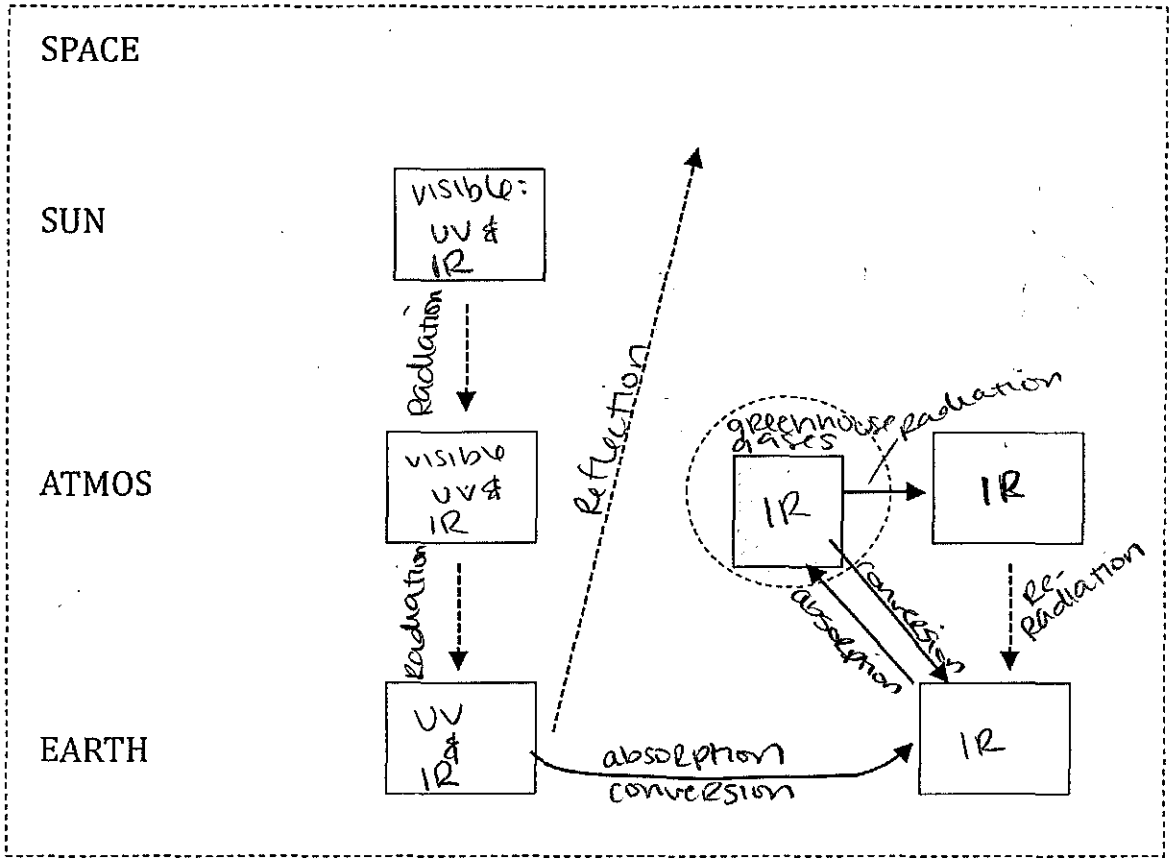
a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases? The energy coming from the sun contains ultraviolet rays & infrared waves but the energy absorbed by the greenhouse gases is only infrared.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface? Earth's surface absorbs UV rays, not IR but both UV & IR are reflected off the Earth's surface.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

Greenhouse gases only absorb infrared, the energy emitted from Earth's surface however is both infrared & ultraviolet.

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**

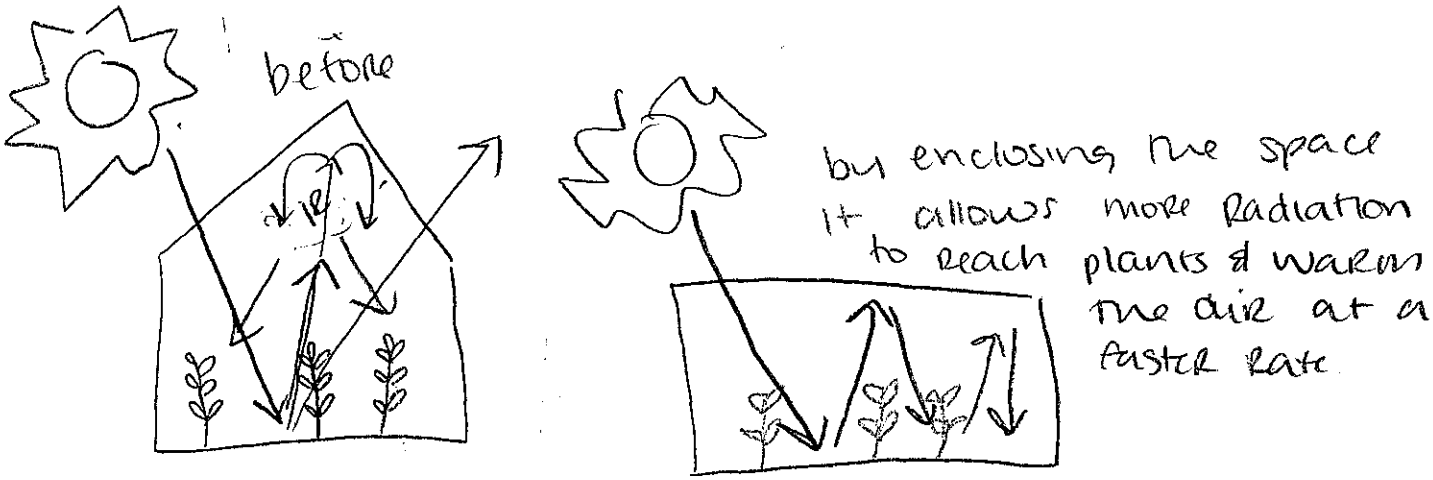


3. Write a complete explanation of the greenhouse effect process in words.

Sun emits different types of light such as ultraviolet & infrared, these are radiated into Earth's atmosphere & visible light (UV & IR) is absorbed into the Earth & gives off infrared heat which is then absorbed by greenhouse gases & then re-released into Earth's atmosphere & surface cycles. The remaining visible light (UV & some IR) is then reflected out of the Earth's atmosphere.

0

4. What would happen if the atmosphere contained no greenhouse gases?
there would be a huge decrease in temperatures, w/o greenhouse gases the IR heat would not be absorped & couldnt use the heat FOR temperature cycles.
5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework
If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

N

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

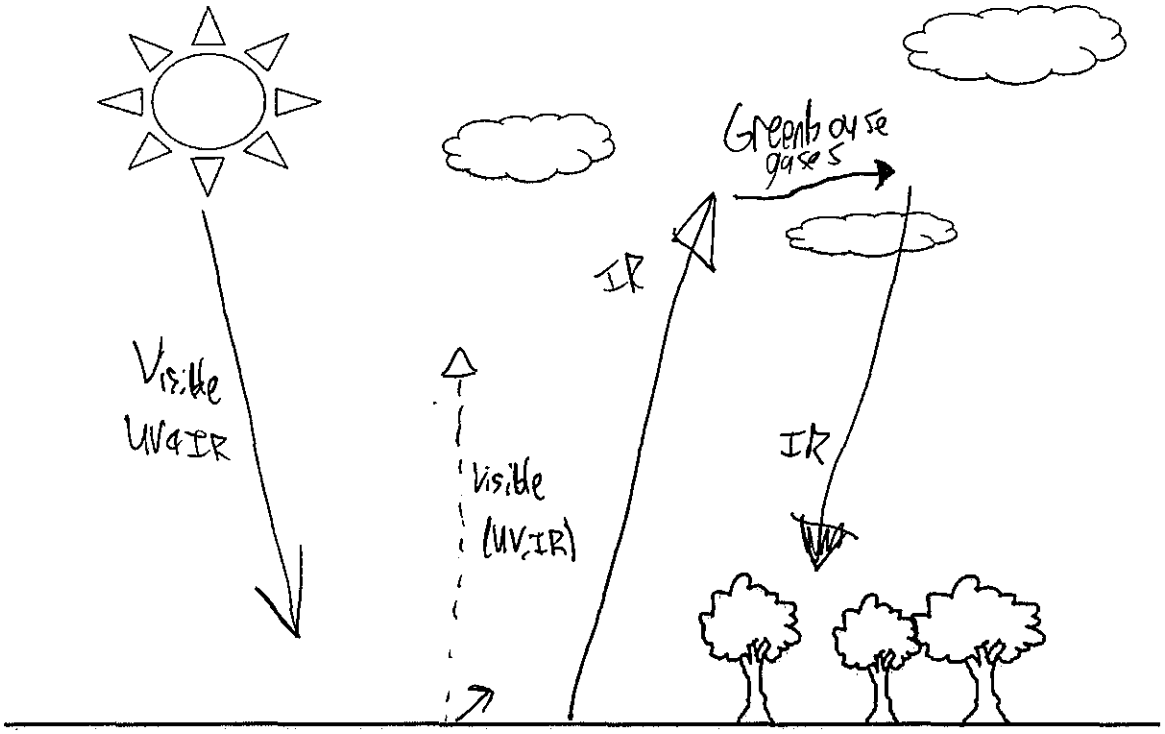
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #: N
Student IDs of Members Present:
[redacted] A43657189
[redacted] A41078891
[redacted] A12833012
[redacted] A42669593

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



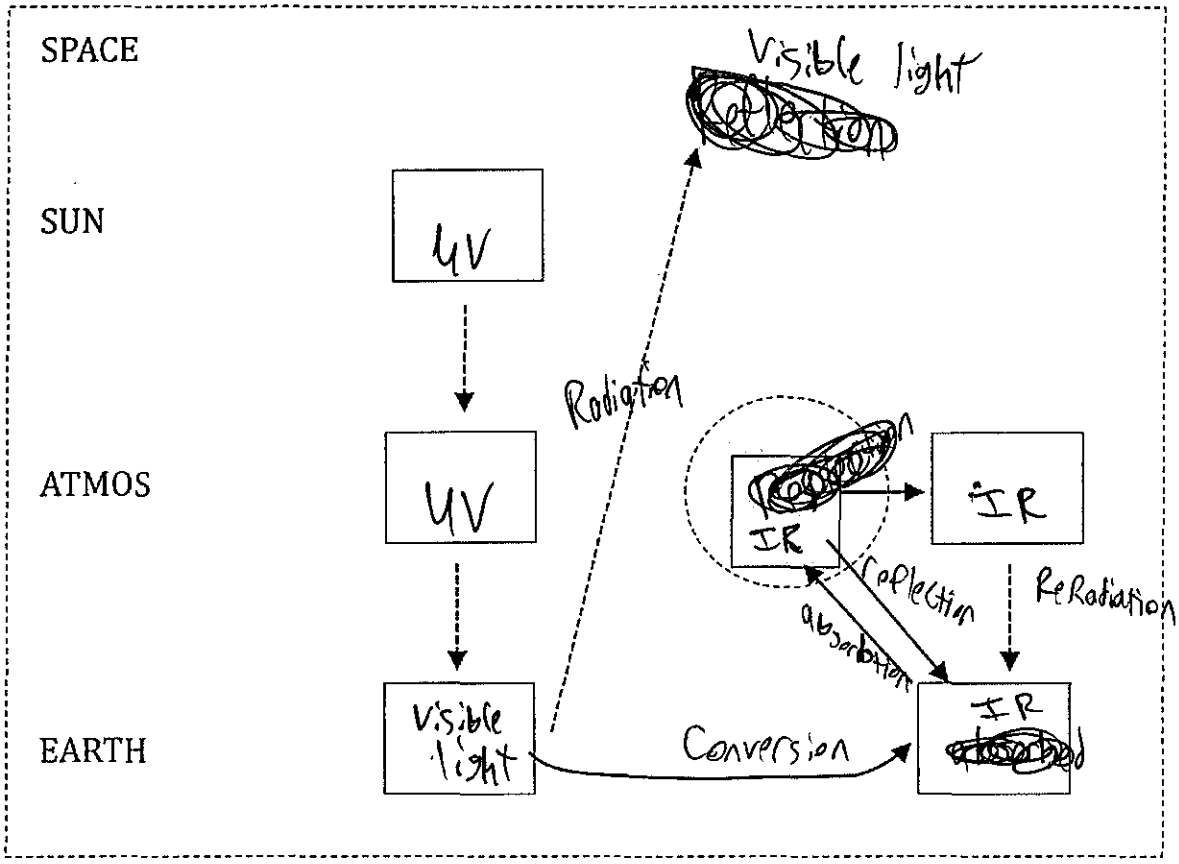
Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases? The sun gives off Infared & visible light. (UV) Greenhouse gases absorb [redacted] only [redacted] infrared

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface? The Earth absorbs Ultraviolet and Infrared but it only emits Infrared.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases? Earth's surface emits Infrared and greenhouse gases absorb Infrared s. the [redacted] two energies are the same.

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

UV rays come to earth and are absorbed by earths surface, then are remitted to the atmosphere and absorbed into the greenhouse gasses

4. What would happen if the atmosphere contained no greenhouse gases?

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

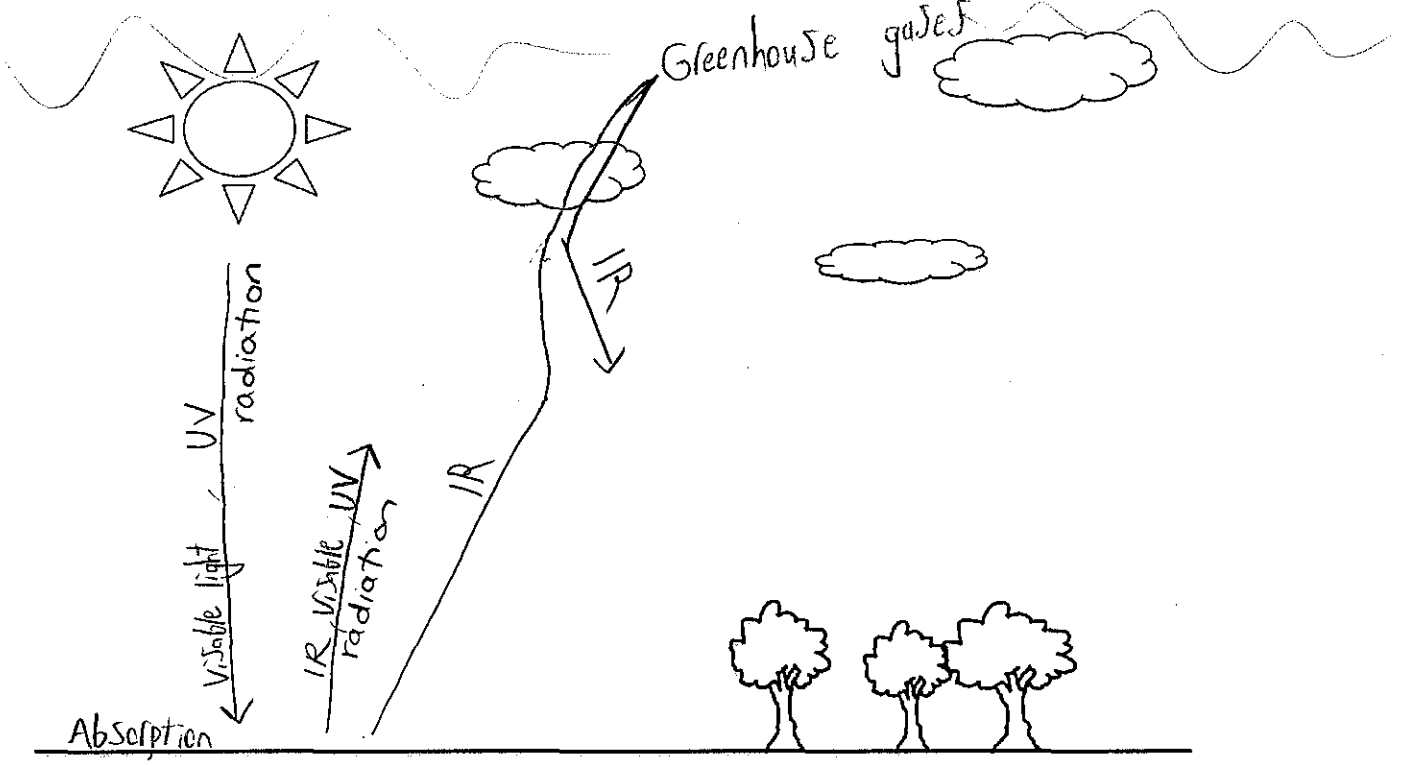
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #: M
Student IDs of Members Present:
[redacted] A34305310
[redacted] A12333175
[redacted] A12773599
[redacted] A43915317

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



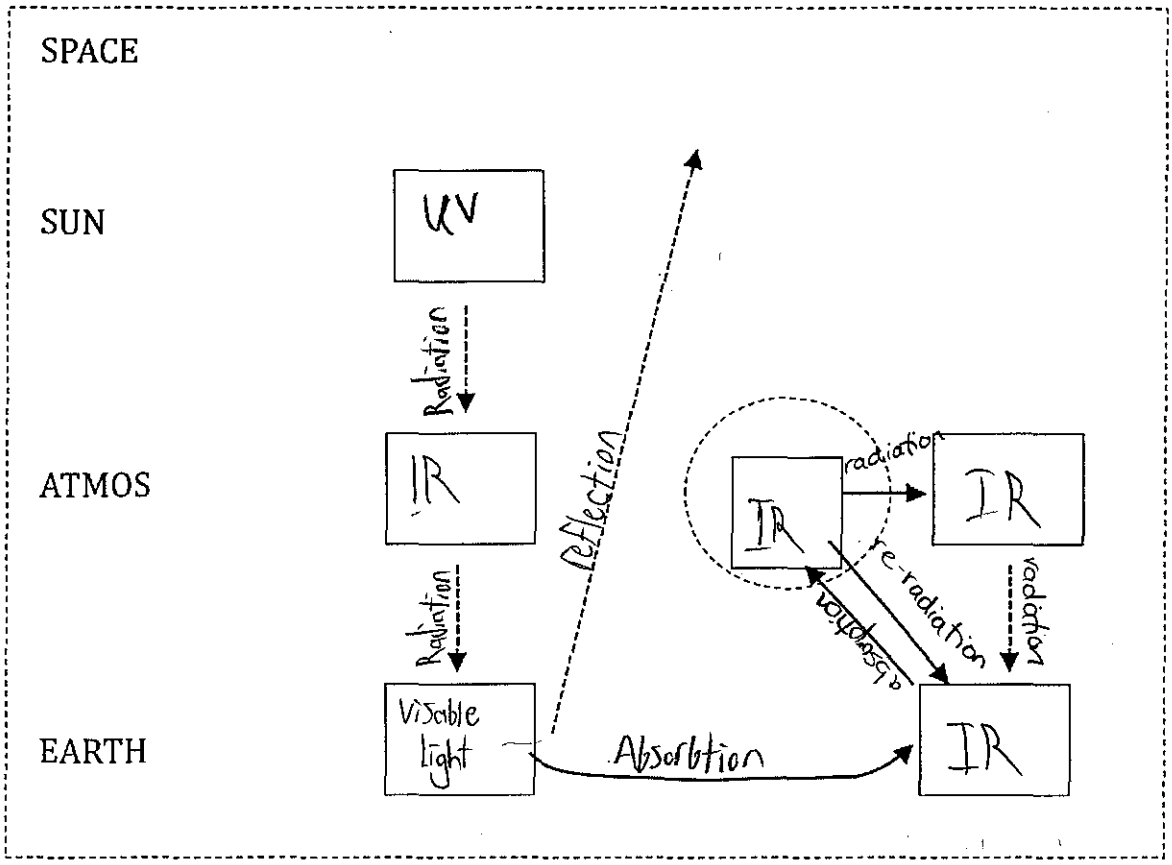
Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?
The sun's energy is in the form of UV light, where the energy absorbed by greenhouses gases is infrared.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?
The energy absorbed by the earth is UV (comes from the sun) and the energy emitted by the earth's surface is UV.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?
The energy emitted by the earth's surface is the same as the energy absorbed by the greenhouse gases (UV)

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **~~Visible Light~~, ~~UV~~, ~~IR~~** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**

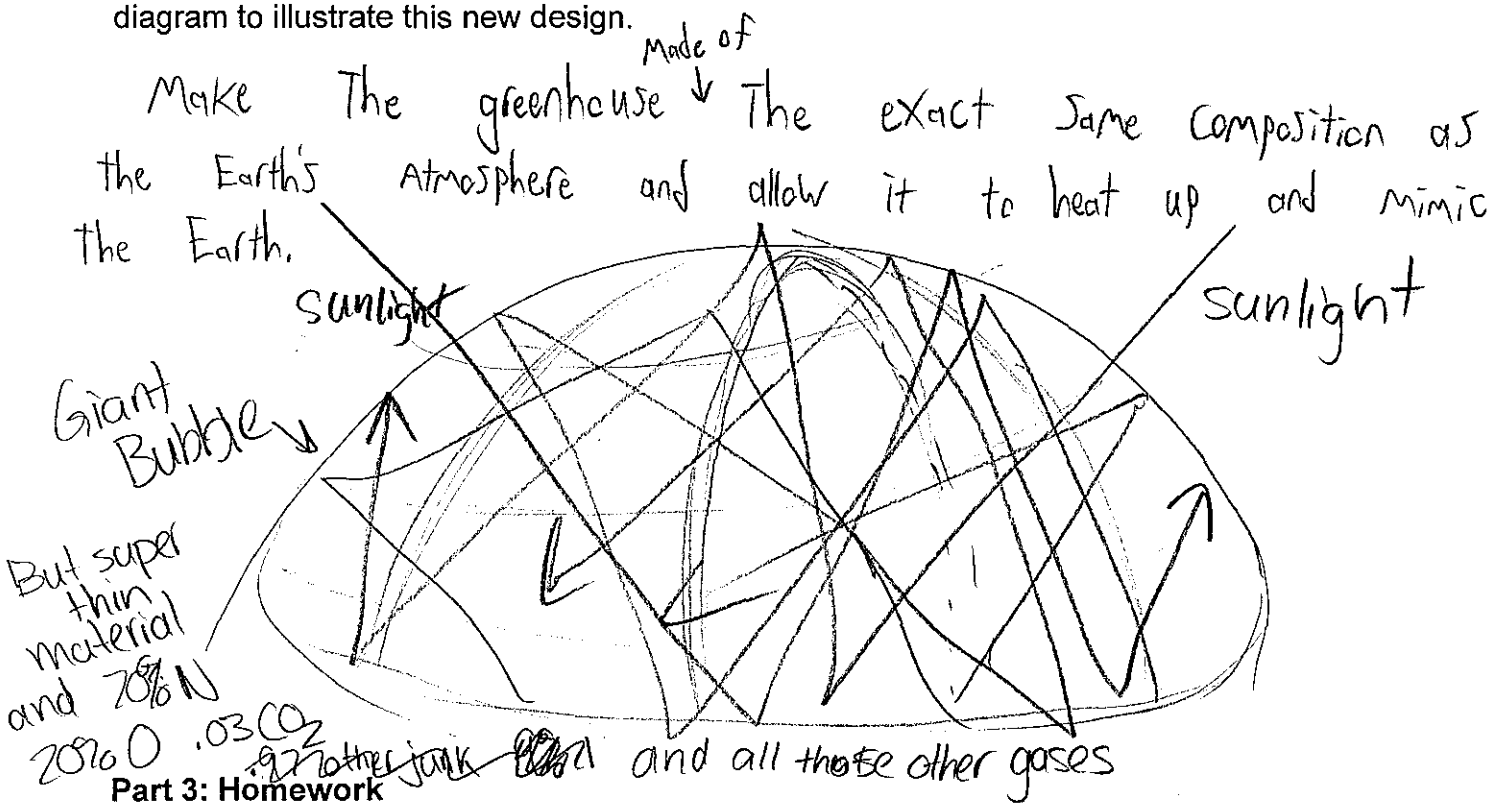


3. Write a complete explanation of the greenhouse effect process in words.

The sun's energy (UV) radiates towards earth, where it reaches the surface as visible light. This energy is partially absorbed and partially reflected back out as IR radiation. Some are reflected off of objects, such as H_2O vapor and clouds, while the greenhouse gases absorb and reradiated back to earth

4. What would happen if the atmosphere contained no greenhouse gases?
The earth would drastically cool, as the radiation reflected off of the ground, clouds, ect. would travel back into space instead of being trapped within the Earth's atmosphere

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

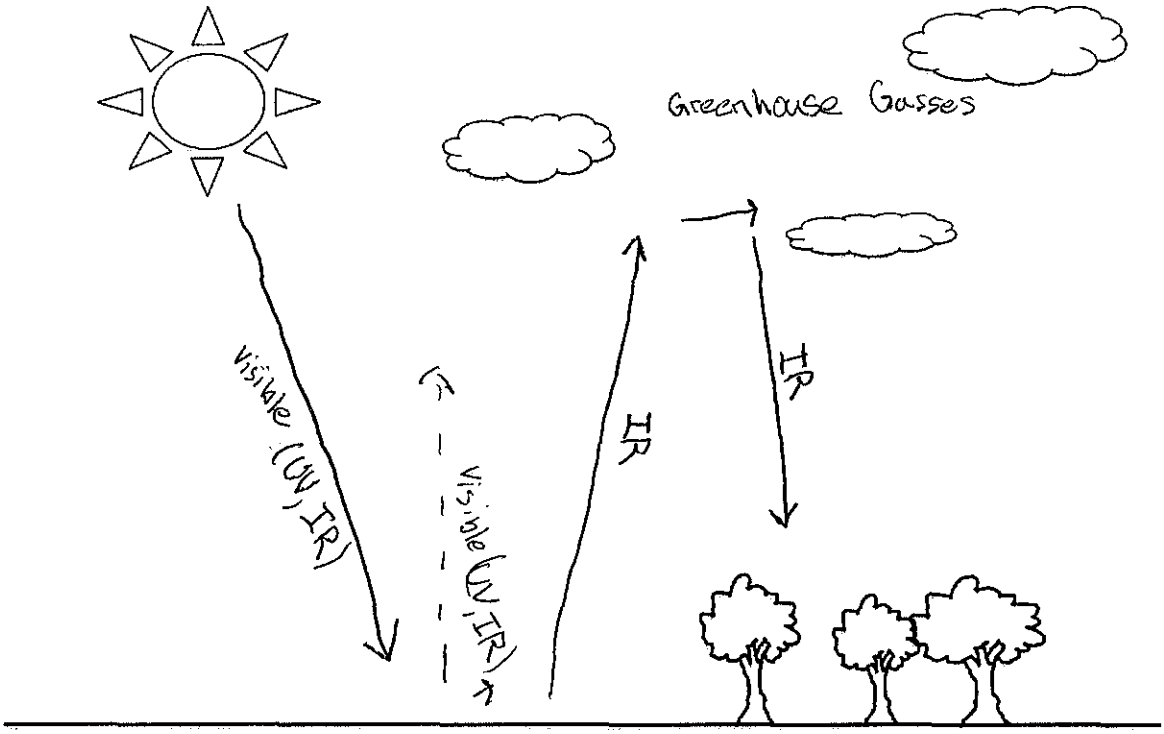
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

L

GROUP #:
Student IDs of Members Present:
[redacted] A4349938
[redacted] A42204625
[redacted] A4206573

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Energy coming from the sun is in the form of visible light, The energy absorbed [redacted] by the greenhouse gasses are in the form of infared light

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

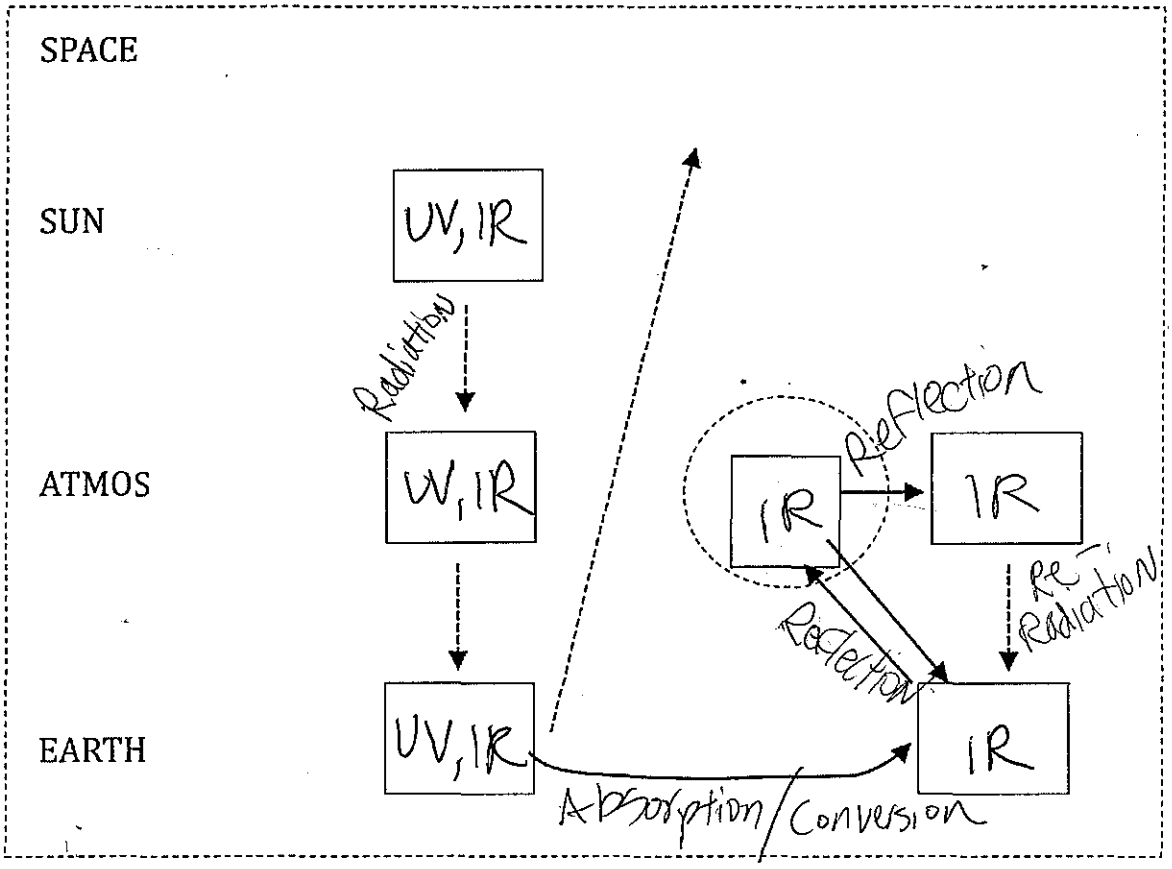
The energy absorbed by earths surface is similar to the energy emitted by eaths surface in the fact that they are both in the form of UV and IR rays.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The energys that is emmitted by earthes surface is in the form of both visible and infared rays. The greenhouse gasses only absorb the infared ones though.

L

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

Visible light gets radiated down to earth from the sun in the form of UV and IR rays. From there the earth absorbs some of these rays and converts the rest into IR rays which are reflected back up to the atmosphere where some of the IR rays are trapped by the greenhouse gasses and re-radiate it back down to the earths surface.

L

4. What would happen if the atmosphere contained no greenhouse gases?
With no greenhouse earths temperature would be very fluctuant with hot days and verey cold nights

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

Part 3: Homework
If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

K

ISP203A – Global Change
Greenhouse Effect

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

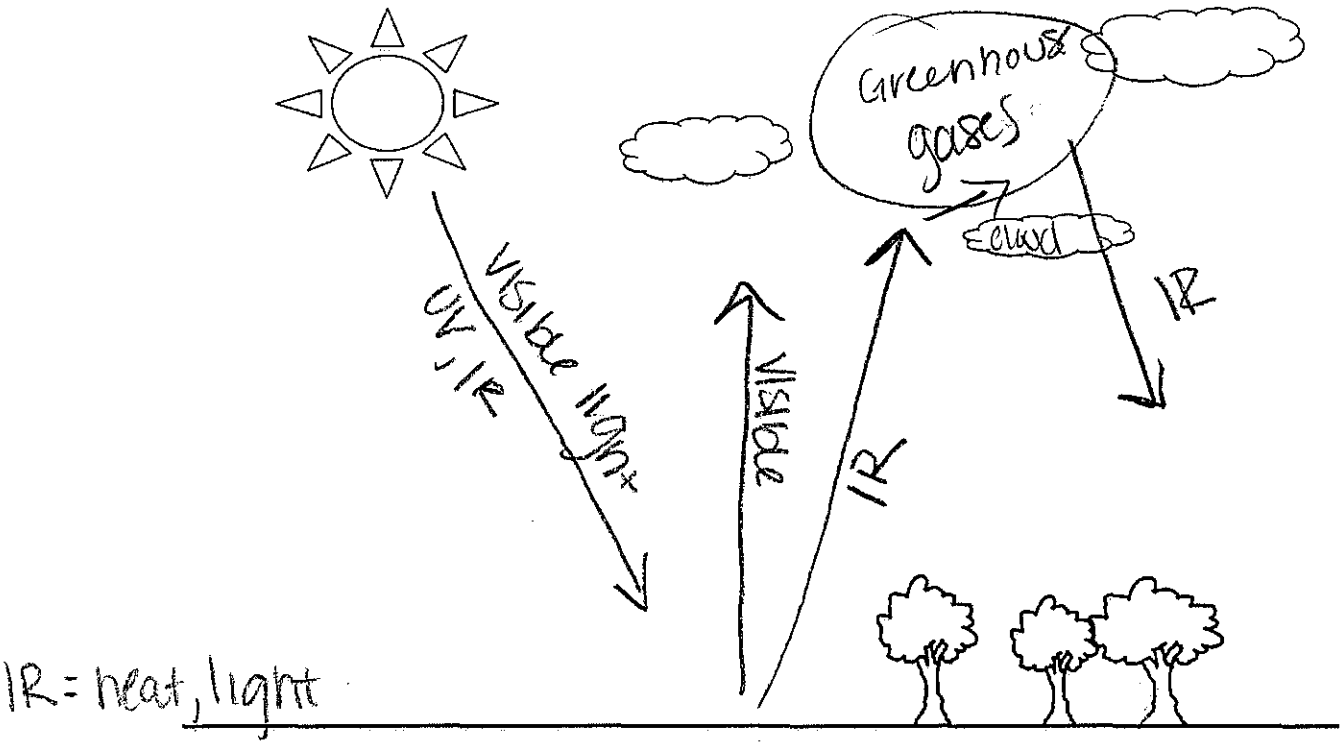
Radiation - energy can be transferred by electromagne wave.

Watervapor
methane
CO_2

ISP203A – Global Change
Greenhouse Effect

GROUP #: K
Student IDs of Members Present:
A43682453
AA26270866
AA33307977

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The same energy is trapped by the Greenhouse effect

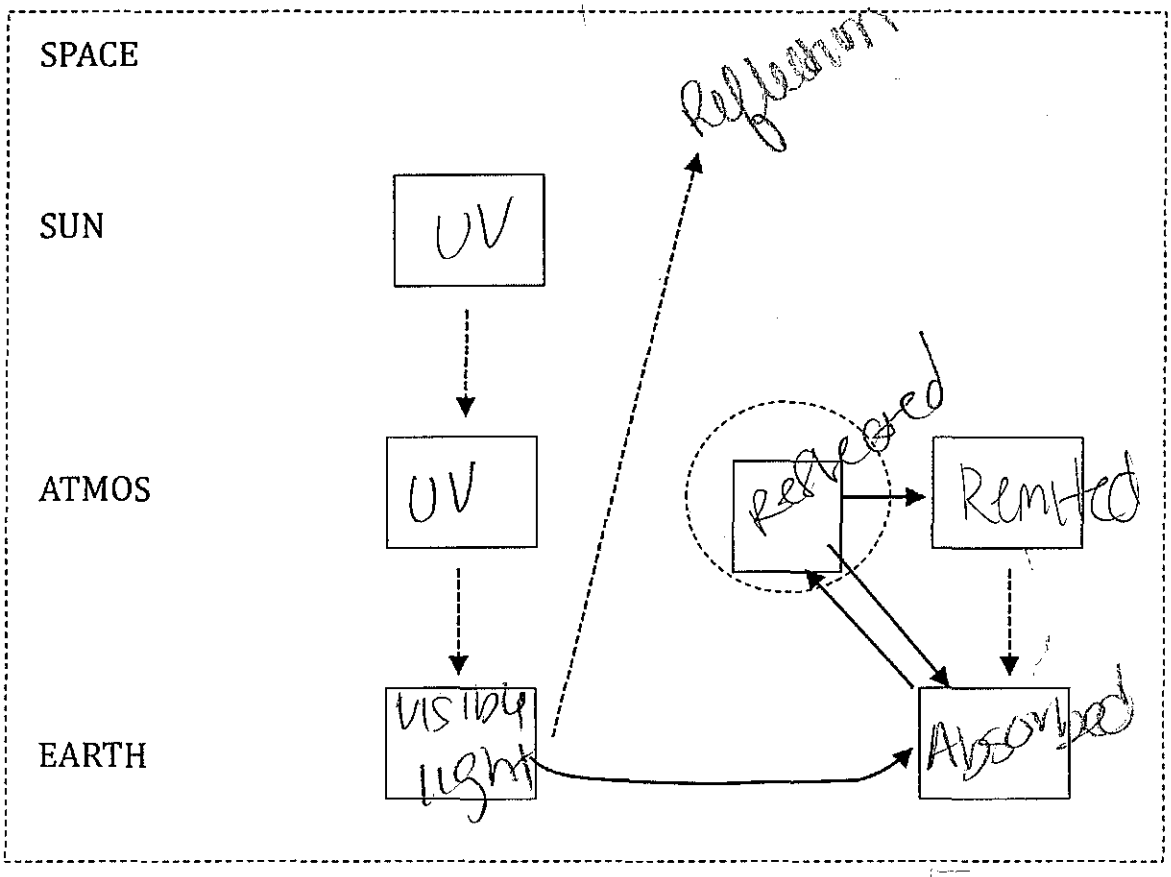
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

Some of it is absorbed + altered when it reaches earth + then remits to atmosphere

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

It has less energy

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

UV rays come to earth. Absorbed by surface then remitted light that are captured in greenhouse effect.

F

4. What would happen if the atmosphere contained no greenhouse gases?

Really hot & really cold

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

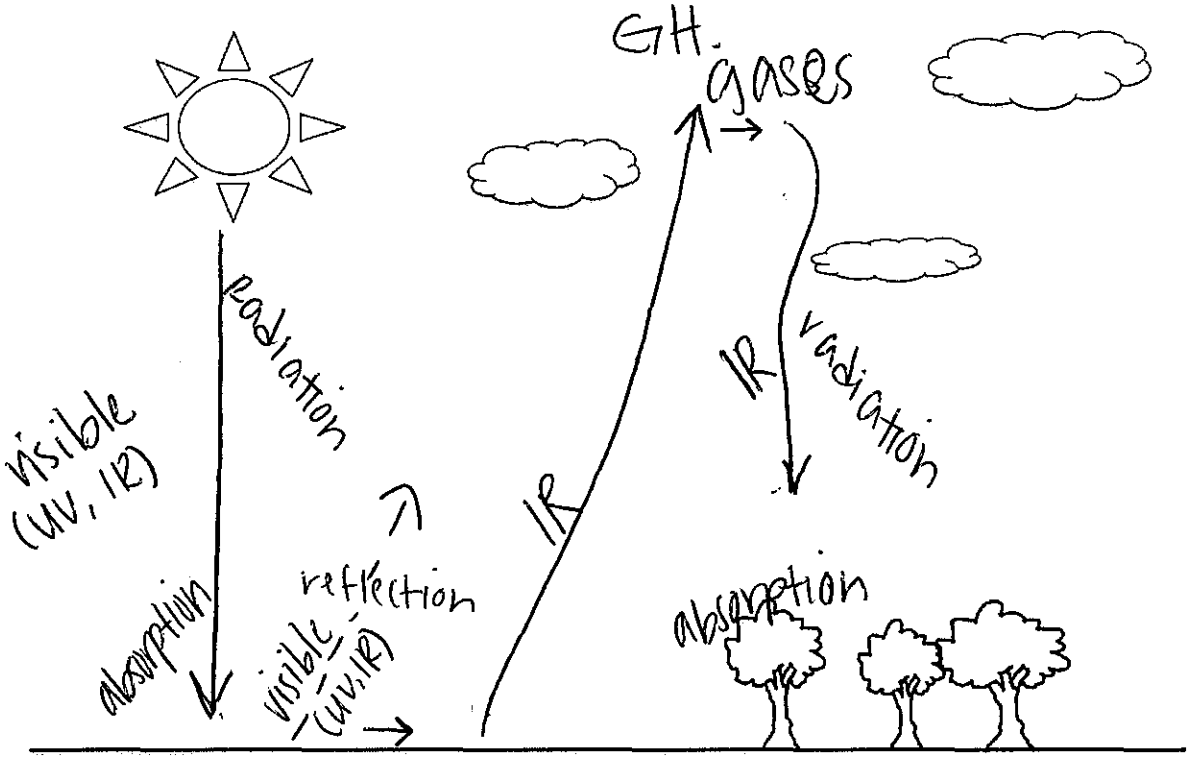
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

J

GROUP #: J
Student IDs of Members Present:
A41069790 A42601752
A42254860

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Similar- both IR radiation
different- the energy absorbed by GH gases is re-radiated

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

Both in the form of infrared radiation

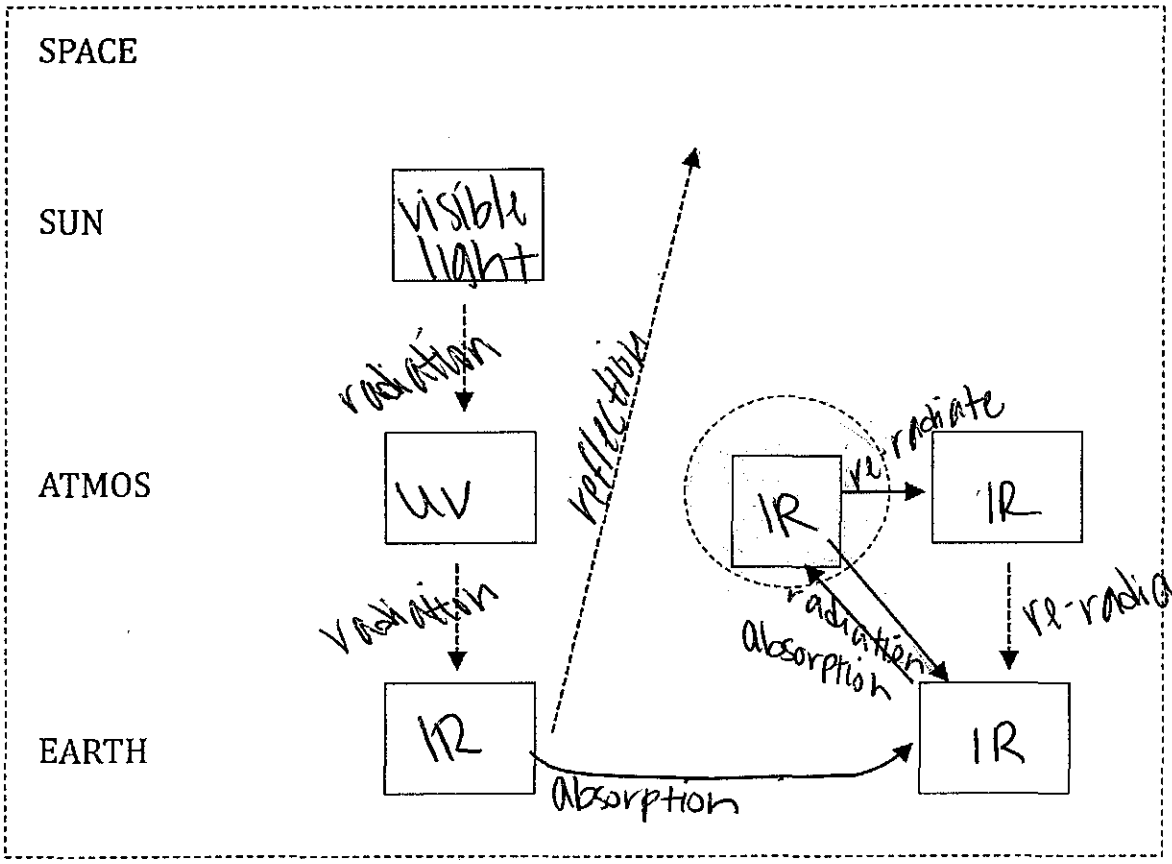
c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The energy that is emitted by Earth's surface includes UV & IR, where only IR is absorbed by GH gases

ISP203A – Global Change
Greenhouse Effect

J

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

The sun radiates ~~UV~~ UV/IR wavelengths ~~into~~ the surface. Some are reflected back into the atmosphere & others are re-radiated back to Earth's surface. The GH gases absorb some of the IR

J

4. What would happen if the atmosphere contained no greenhouse gases?

the temperature would ~~increase~~ decrease

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

allow some of the heat ~~from~~ inside the greenhouse escape, just like some of the IR wavelengths that reflect back into the atmosphere.

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

I

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

- radiation
  - infared-wavelength > 700 nanometers
  - ultraviolet wavelength < 400 nanometers

greenhouse effect
- involves sun
- traps heat
- CO_2
- plants
- long waves and short waves

- gases in atmosphere
  - nitrogen 78%
  - oxygen 20% CH_4
  - rest - 2% (CO_2, methane, water vapor)

(visible light or heat (a type of light))

radiation - energy transfered through electromatic waves

conduction - heat energy transfered by atoms and molecules (through solid materials

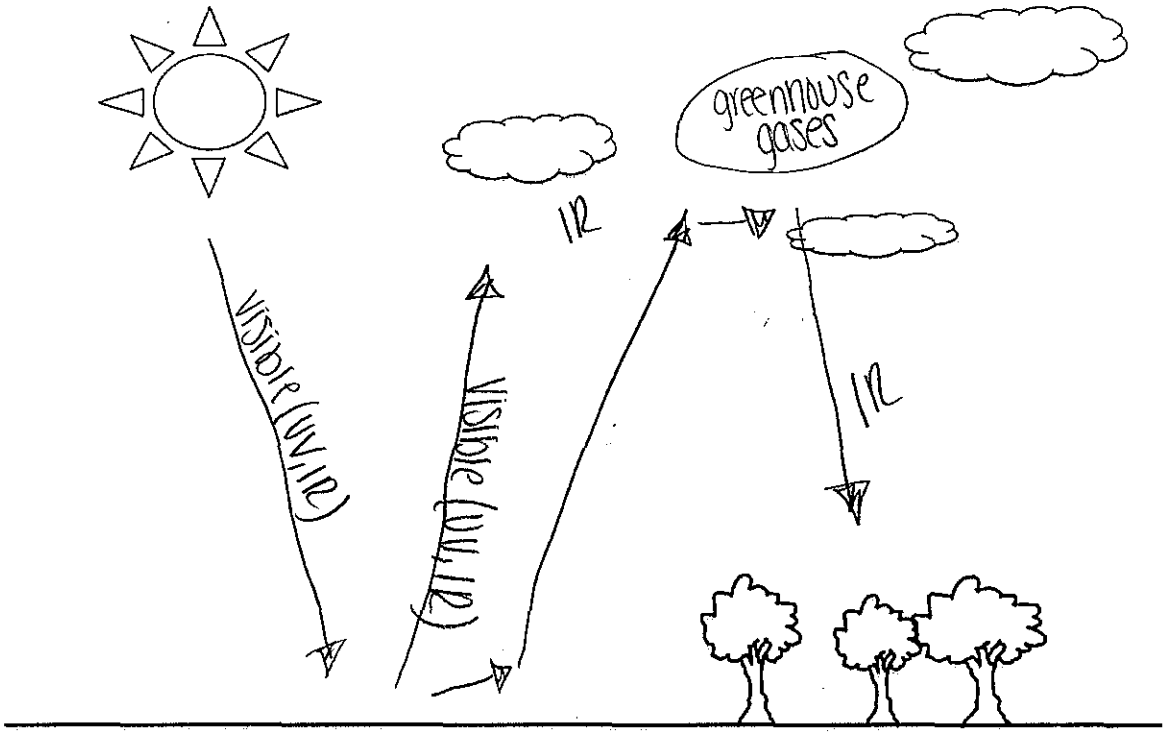
convection - circulation due to density

ISP203A – Global Change
Greenhouse Effect

I

GROUP #:
Student IDs of Members Present:
A40840884
A42097140

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?
Similar - the sun has IR also
different - the sun gives off visible light

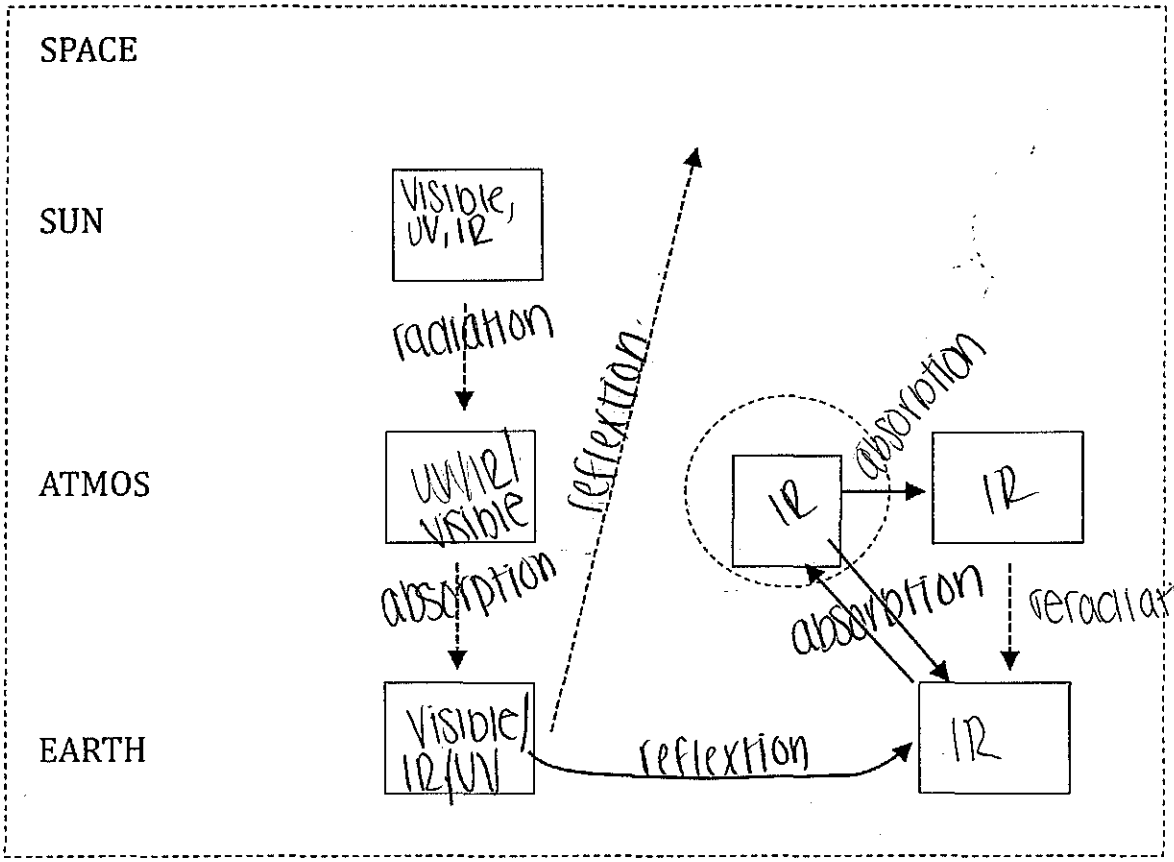
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?
it is different because greenhouse is only IR light

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?
the energy emitted by the Earth's surface is UV and IR but the energy absorbed by the greenhouse gases is just the IR.

ISP203A – Global Change
Greenhouse Effect

I

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**

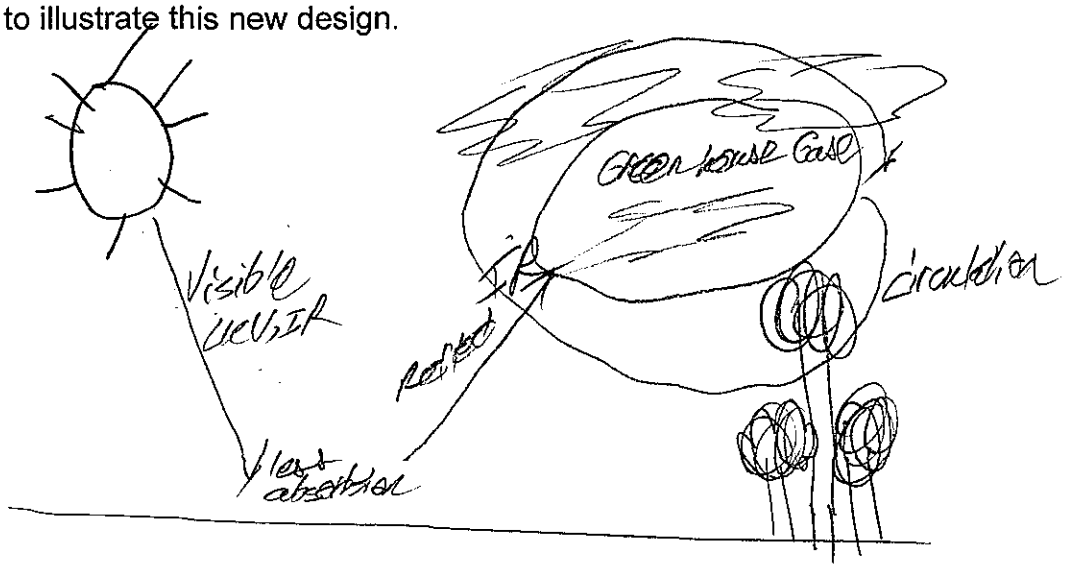


3. Write a complete explanation of the greenhouse effect process in words.

The sun radiates visible light & a little UV, IR. The visible, IR, UV is then absorbed by the Earth. The Earth reflect some visible, UV, & IR into space. Other reflects to Greenhouse gases, only IR reflects, there is reradiation by the the Earth of the IR, & it circulates. The rest goes to the ocean

4. What would happen if the atmosphere contained no greenhouse gases?
then the heat would not circulate back to the earth and it would be much colder. Temperature would fluctuate greatly

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework
If you complete the group work, you may work on the homework **on your own.** This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

H

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

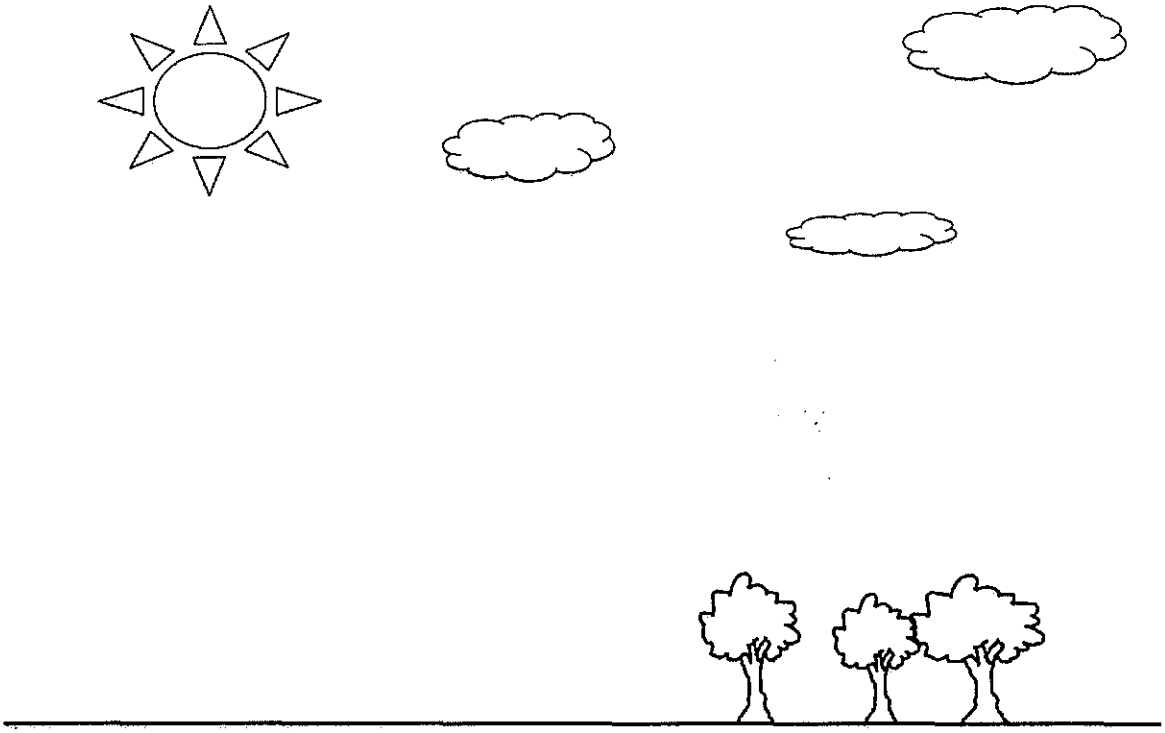
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

H4

GROUP #:
Student IDs of Members Present:
[redacted] A45139440
[redacted] A40250026

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases? the energy from the sun is visible, IR and UV light. The energy absorbed by the greenhouse gases is just IR.

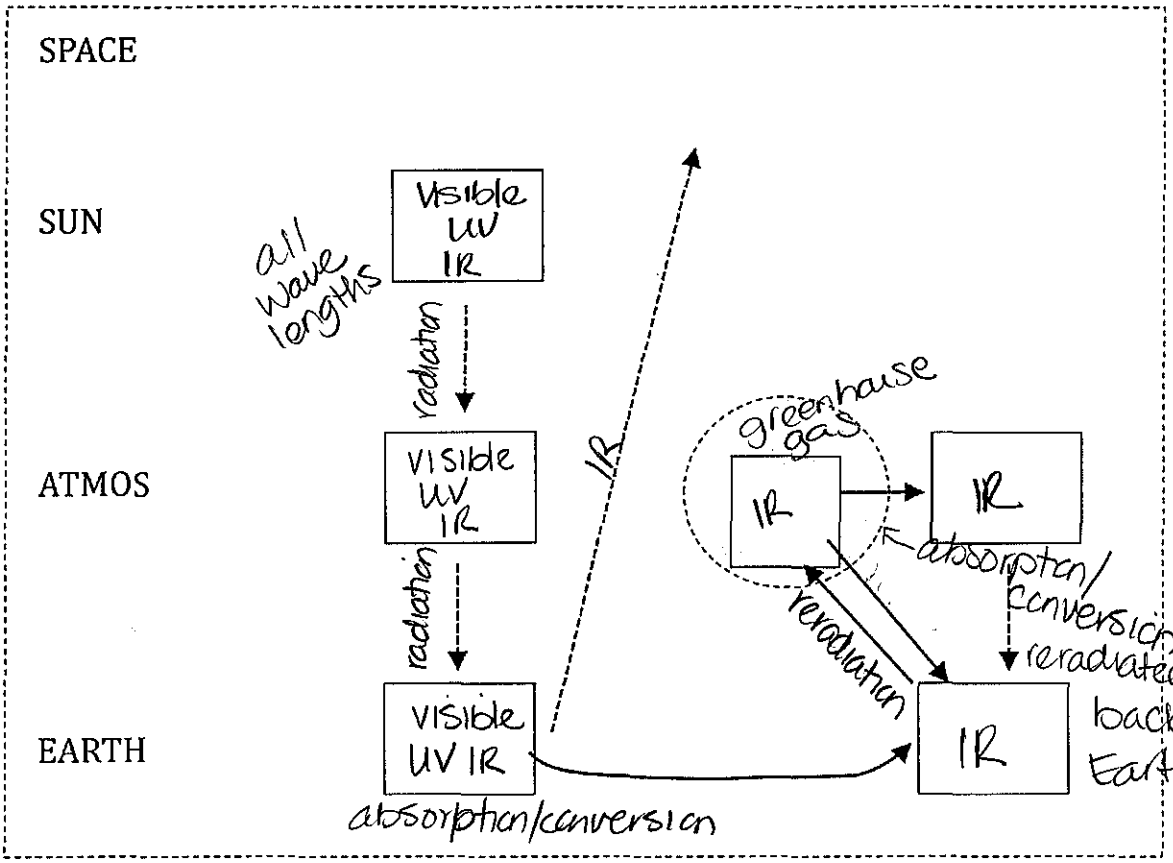
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface? The energy that is emitted by Earth's surface is IR while the energy absorbed by Earth also includes UV and visible.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

They are both infrared!

A

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

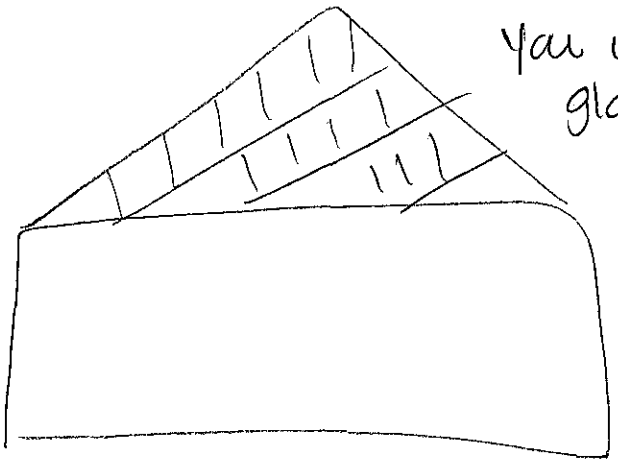
The sun gives off solar electromagnetic radiation, and mostly visible light, infrared, and UV rays are radiated through our atmosphere. Earth absorbs the visible, UV and IR light and reflects the IR back, where it is reradiated back to Earth as IR light.

H

4. What would happen if the atmosphere contained no greenhouse gases?

It would be very cold at night and hot during the day. The Earth would hold no heat.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



You would design a glass material that would absorb the IR heat instead of not letting it out like glass normally does

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

6

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

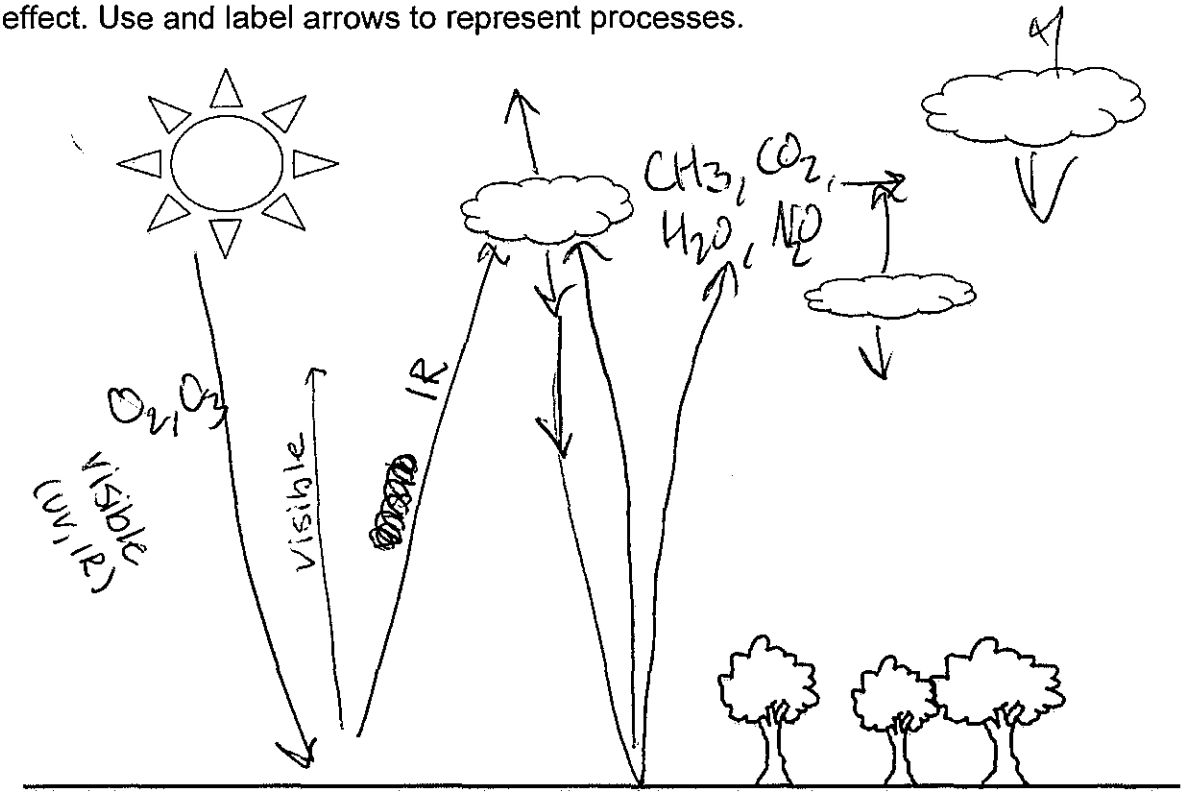
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #:
Student IDs of Members Present:
A40659708
A41598990 A42235241

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The Sun emits short wave radiation. When the short waves reflect back, it comes back as long wave radiation.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

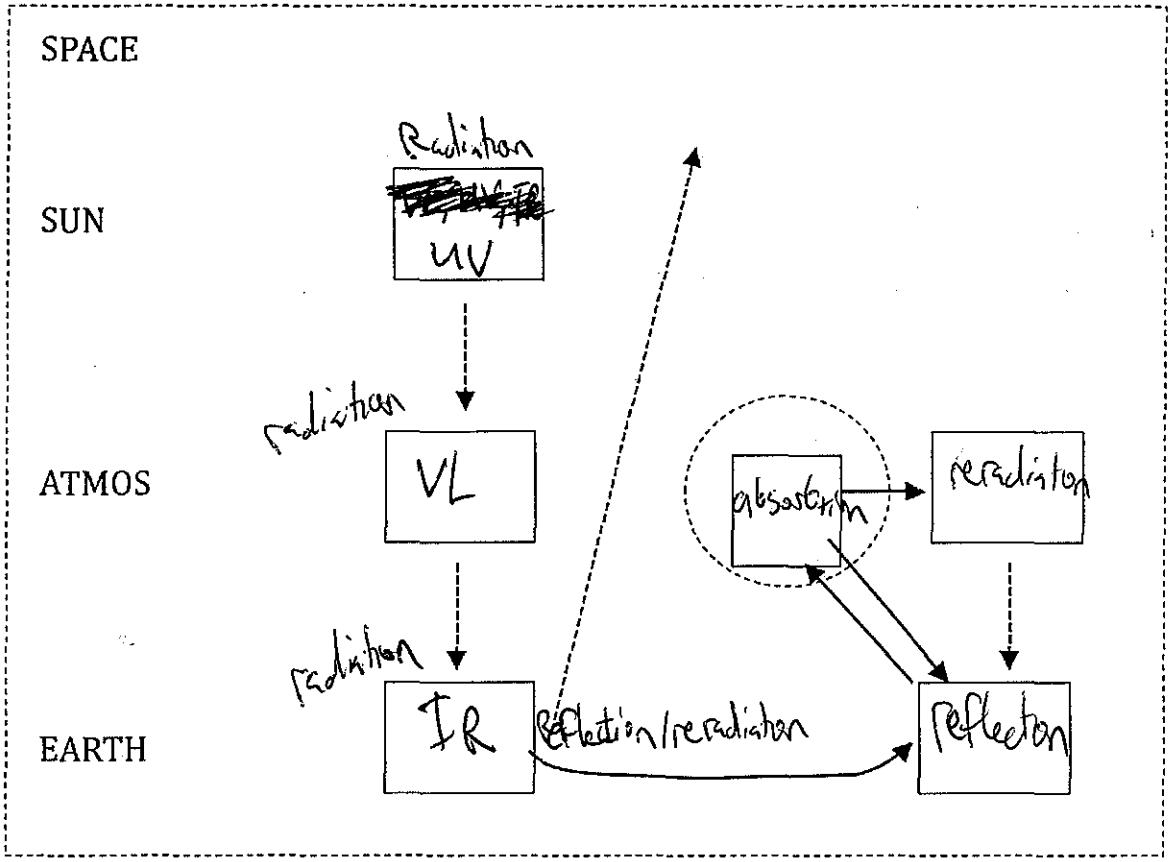
Same answer from A. The wave types entering the surface are short and when they radiate back to the atmosphere it comes as long wave radiation.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The energy is similar to the energy that emited by Earth's surface is absorbed by the greenhouse gases because they waves are both long wave radiation.

6

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

Sun emits short waves to the earth. Short waves can easily slide through the atmosphere and its green house gases. When the short waves hit the ground it will radiate back as long wave radiation and when the waves hit the atmosphere, its green house gases ~~that hold the gasses in the atmosphere~~ (CO_2, CH_4, H_2O, N_2O) will absorb the waves and created their own heat sending it back to earth/space.

6

4. What would happen if the atmosphere contained no greenhouse gases?
It's long waves that radiate back would leave the atmosphere and wouldn't be traped to warm the world.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

Design a new roof that has different levels like the atmosphere has different layers to retain heat. This will help greenhouses retain heat when there is no sunlight available.

Part 3: Homework
If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?
We would be cold when theres no light because the earth would not retain heat.
2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?
Temperature would rise because the long layers would be absorbed more due to the increase in green house gases.
3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.
Greenhouse effect is not the cause, but the increase in greenhouse gases.

ISP203A – Global Change
Greenhouse Effect

F

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

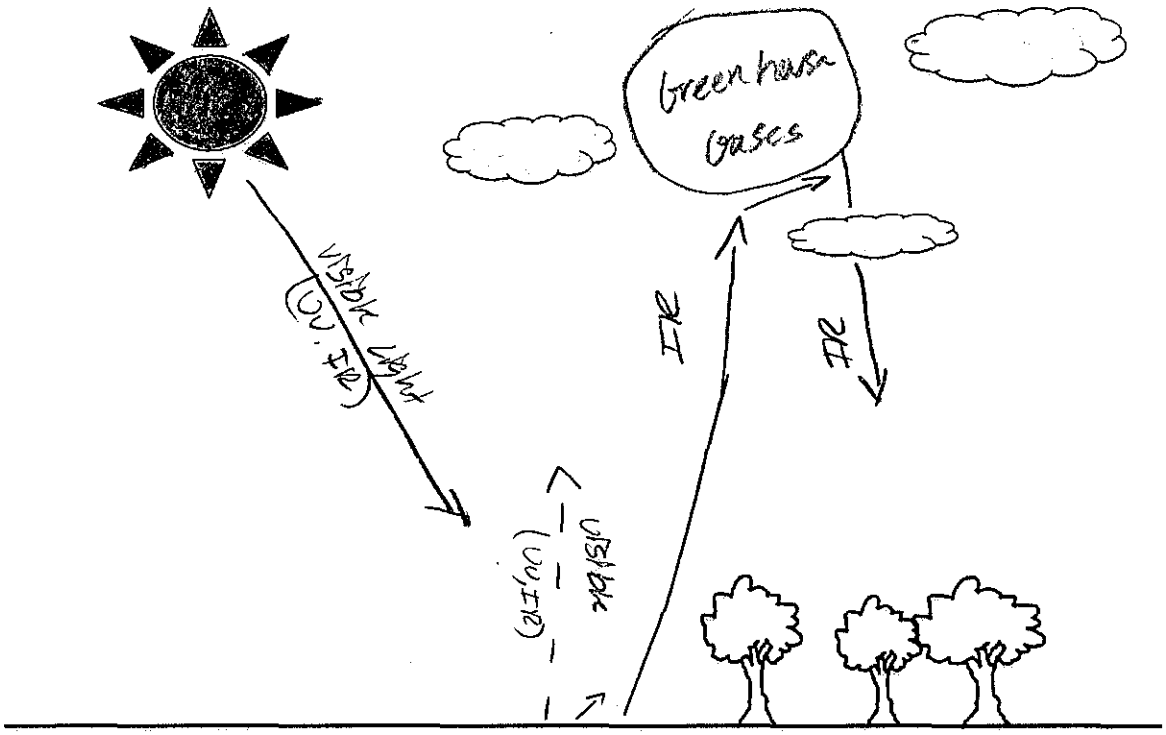
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #: F
Student IDs of Members Present:
A42385484 A41450320
A42766836

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Both are visible light

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

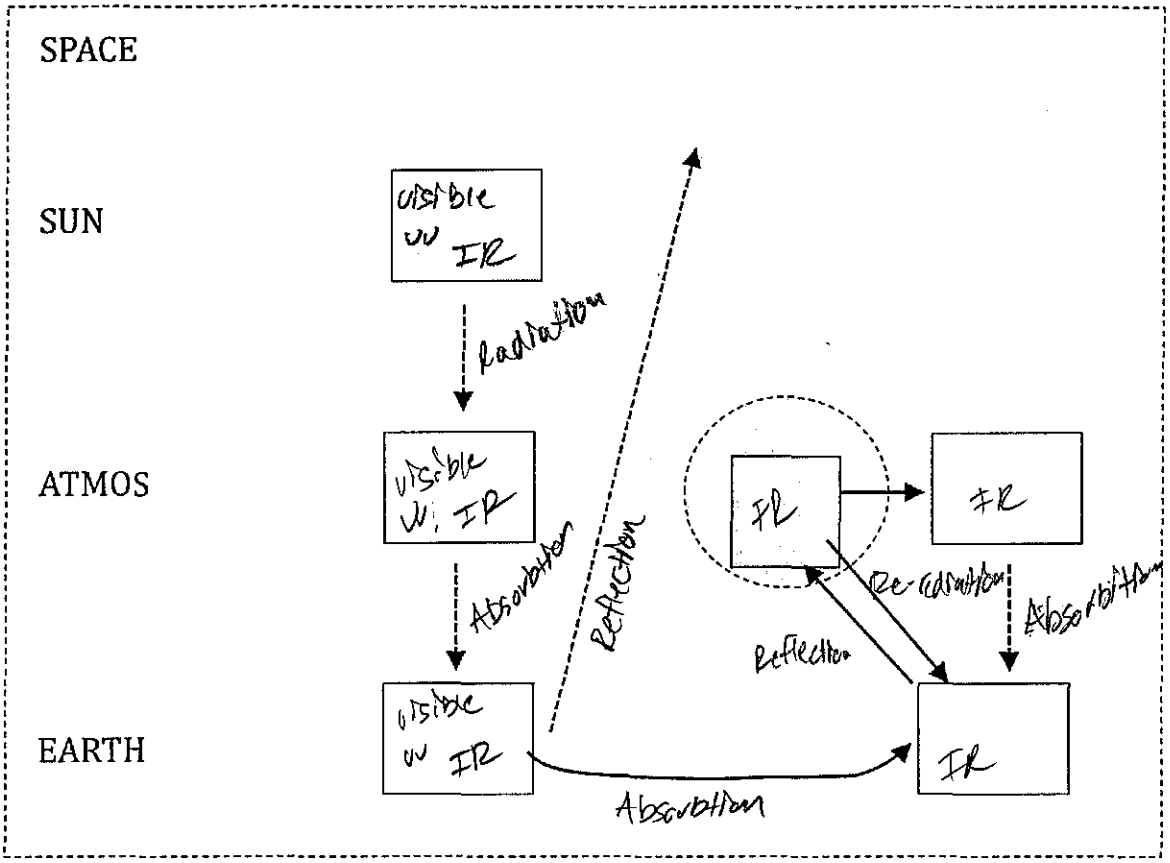
Earths surface absorbes visible light, ? emits infared light

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

Both are Infared light.

F

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

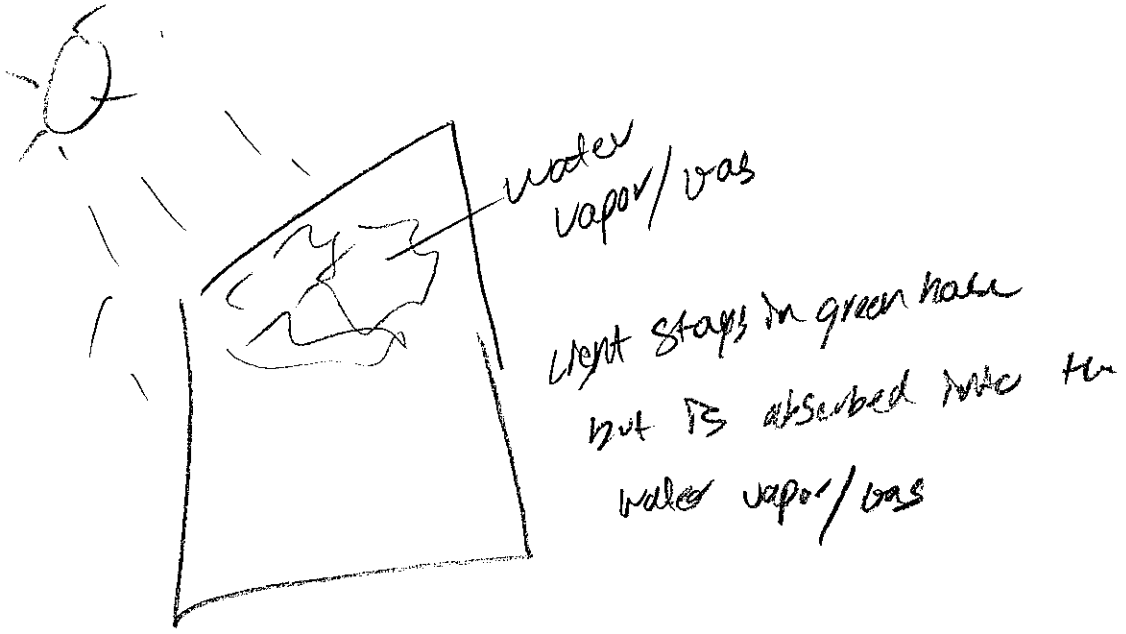
Sun emits the 3 different types of energy, the ground absorbs the IR and then reflects it back into the atmosphere. Green house gases absorb it & reflect the IR back down into the ground where it is absorbed.

F

4. What would happen if the atmosphere contained no greenhouse gases?

really high temp. during days & really low temp. during nights.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own.** This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

E

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

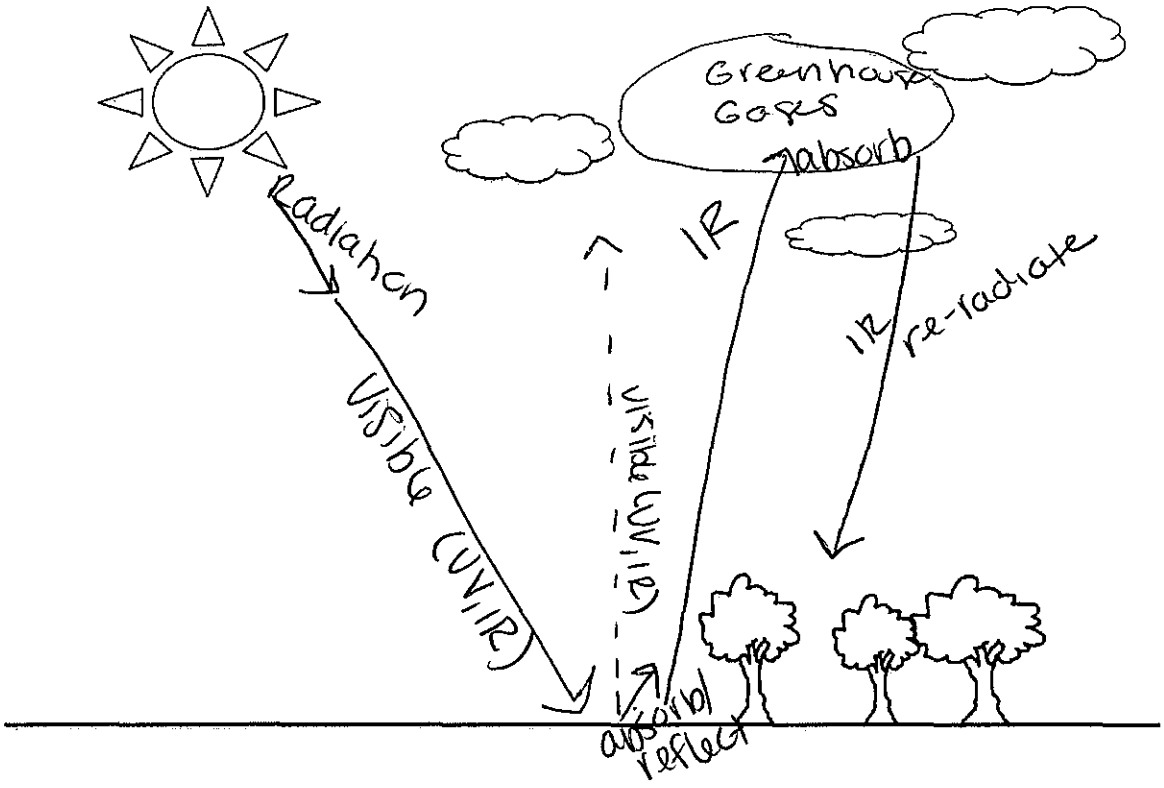
5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

GROUP #: E
Student IDs of Members Present:
A42190700- [redacted]
A39228160 - [redacted]
A40518651- [redacted]
AH1503028- [redacted]

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases? Different materials allow different wavelengths to absorb through it. Earths energy absorbs solar energy and reabsorbs into the atmosphere as IR, some goes back to space.

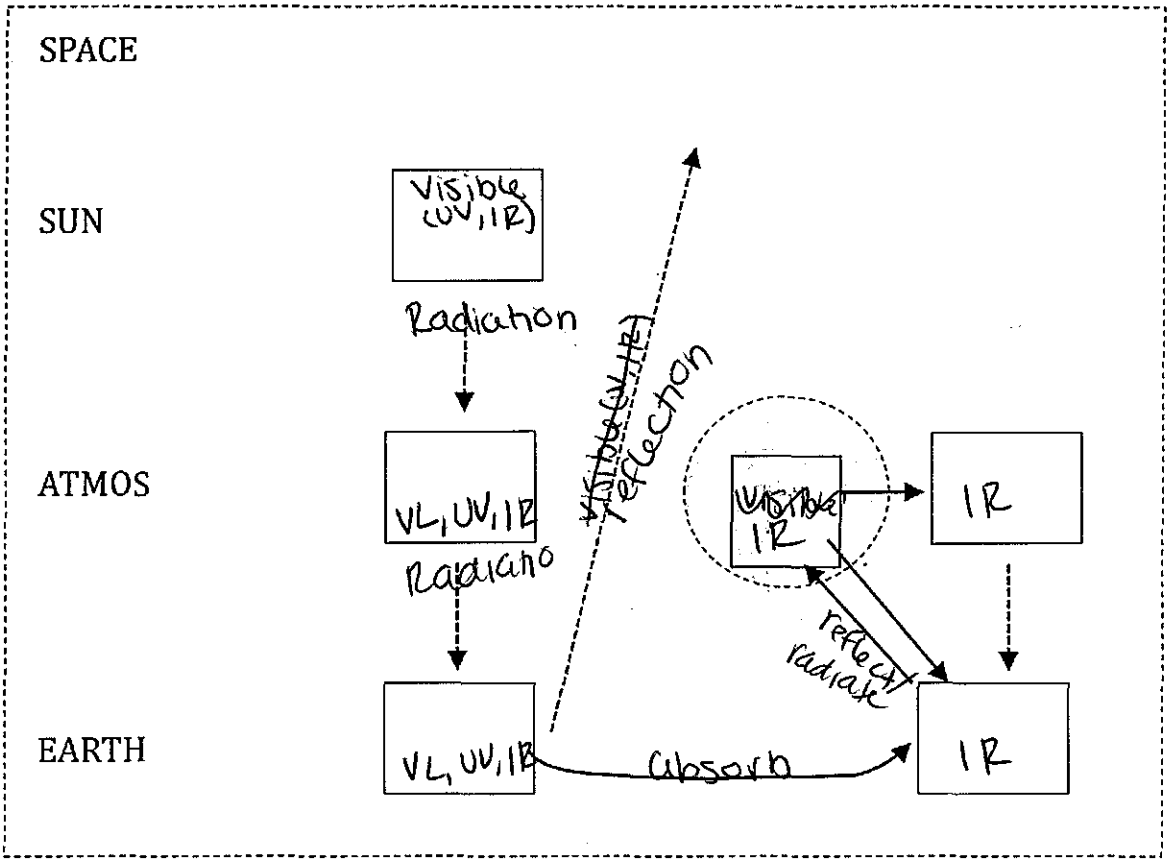
b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface? the gases re-radiate the energy as heat back towards the earth, causing the Greenhouse effect.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?
The gases that were re-radiated as heat from the earth cause the Greenhouse effect.

ISP203A – Global Change
Greenhouse Effect

E

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

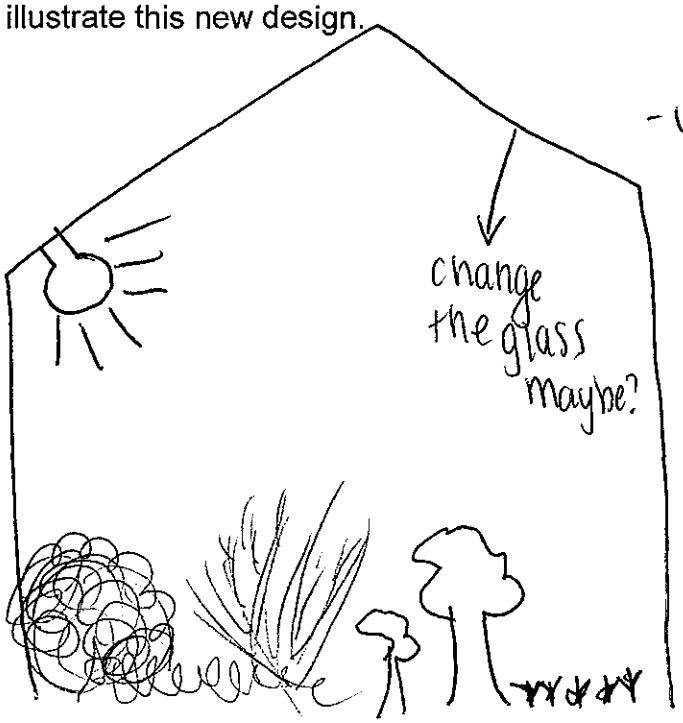
The sun radiates VL, UV, IR, to the atmosphere which radiates UV to earth, the earth absorbs and then radiates visible light as UV and IR, and also radiates IR which gets stuck and then absorbed by greenhouse gases in the atmosphere and then turns into IR back in the atmosphere and the earth

E

4. What would happen if the atmosphere contained no greenhouse gases?

would make the temperature range extreme. Also helps makes life sustainable.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



- we would design it where instead of reflecting the heat it would absorb and re-radiate the heat.
- This way the heat would be circulated.

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL**.

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

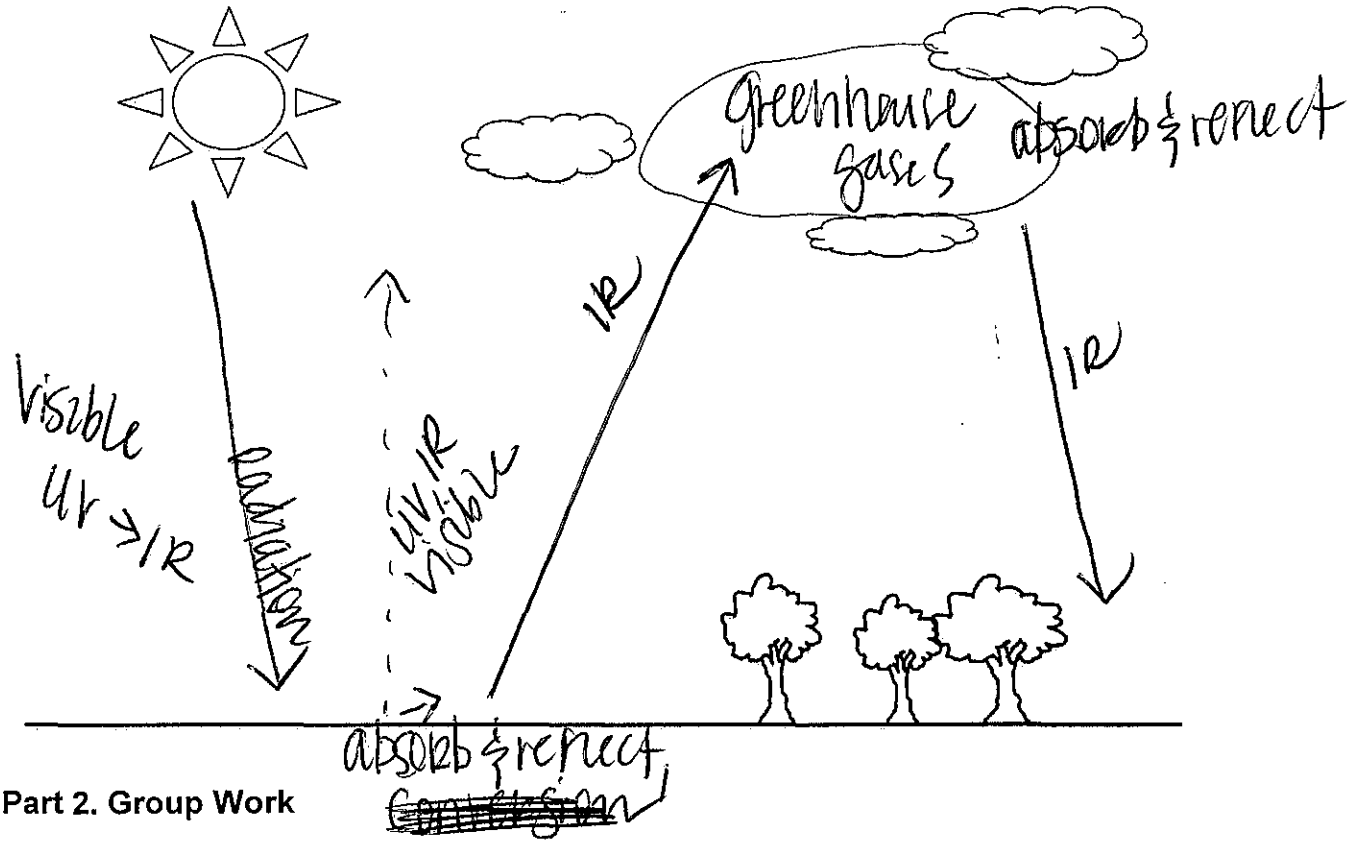
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

D

GROUP #:
Student IDs of Members Present:
A43570651 A40627897
A37599308 A40177778

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Similar to energy absorbed by greenhouse gases because it still contains infrared rays but different because energy from sun mostly visible light while some absorbed by greenhouse gases IR.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

Earth's surface mostly absorbs visible but can only reflect infrared back into atmosphere & gases

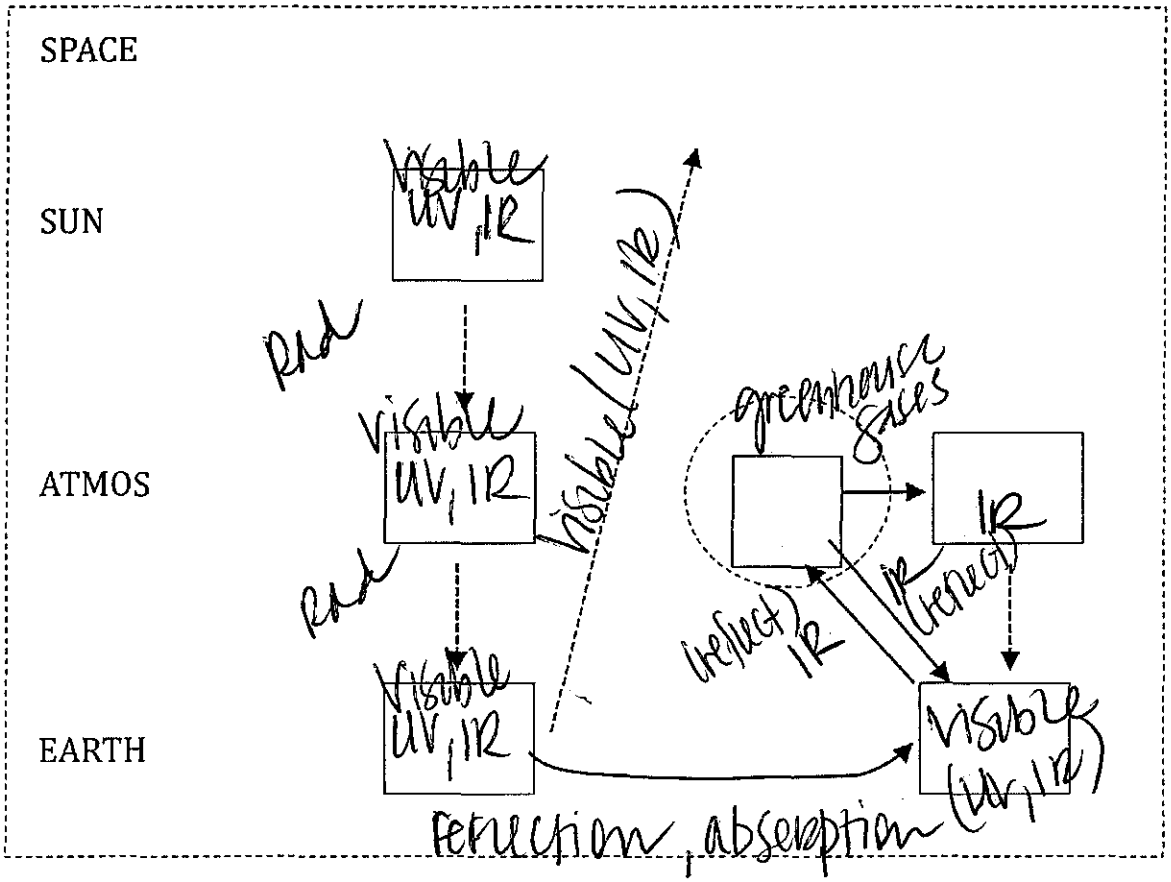
c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

Earth's surface emits infrared just as greenhouse gases absorb & remit infrared.

ISP203A – Global Change
Greenhouse Effect

D

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

Sun emits visible, UV, & IR rays into the atmosphere. Some is absorbed by the atmosphere, some is reflected back to the sun and some reflected and absorbed by the earth's surface. From the earth's surface some visible, UV & IR rays are reflected back into atmosphere while IR rays are reflected & absorbed by greenhouse gases. Some green house gases reflect IR rays back to earth's surface where they are absorbed or reflected back

4. What would happen if the atmosphere contained no greenhouse gases?

too hot during the day with no cloud cover & too cold at night make temperatures unregulated &

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.

uninhabitable for humans

• having a ventilation system in the greenhouse allowing heat or IR to escape as it can from the earth's surface into the atmosphere as oppose to being trapped in the greenhouse as it is currently.

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

leave, too cold because heat back to sun

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

too hot

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

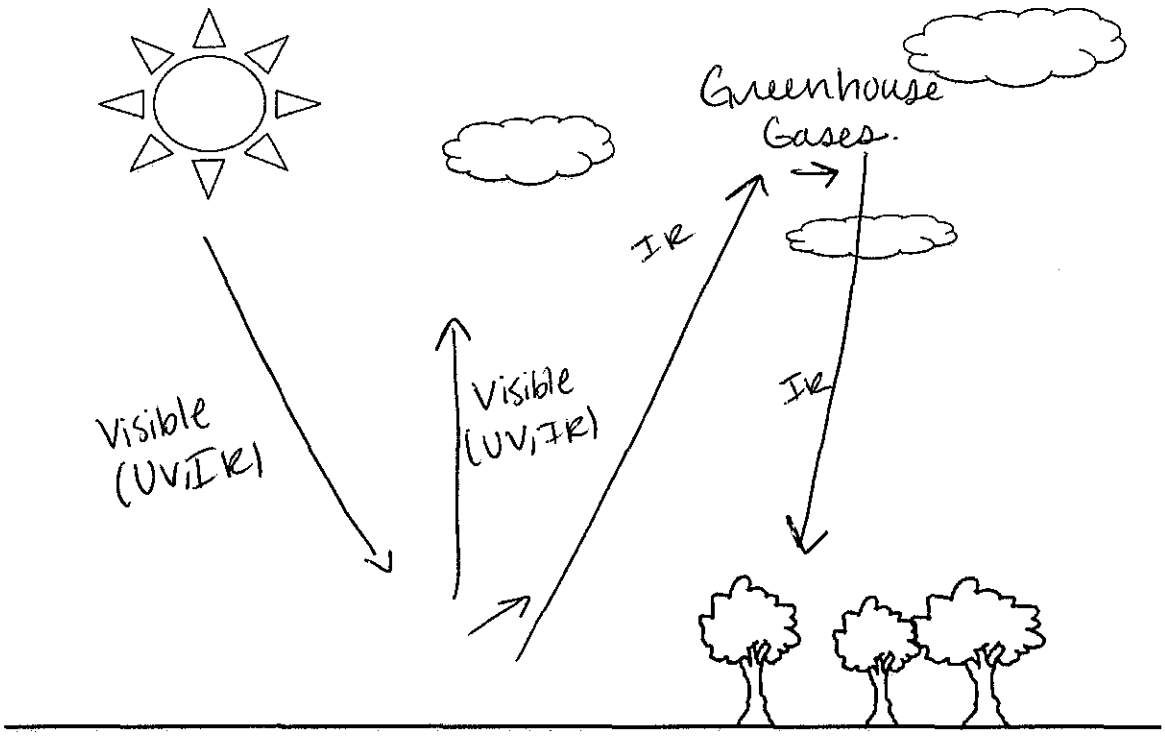
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

C

GROUP #:
Student IDs of Members Present:
A42483118
A42609057 A42741352
A42226052

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The difference is that the wavelengths from the Sun are shorter but once they become absorbed, they become longer.

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

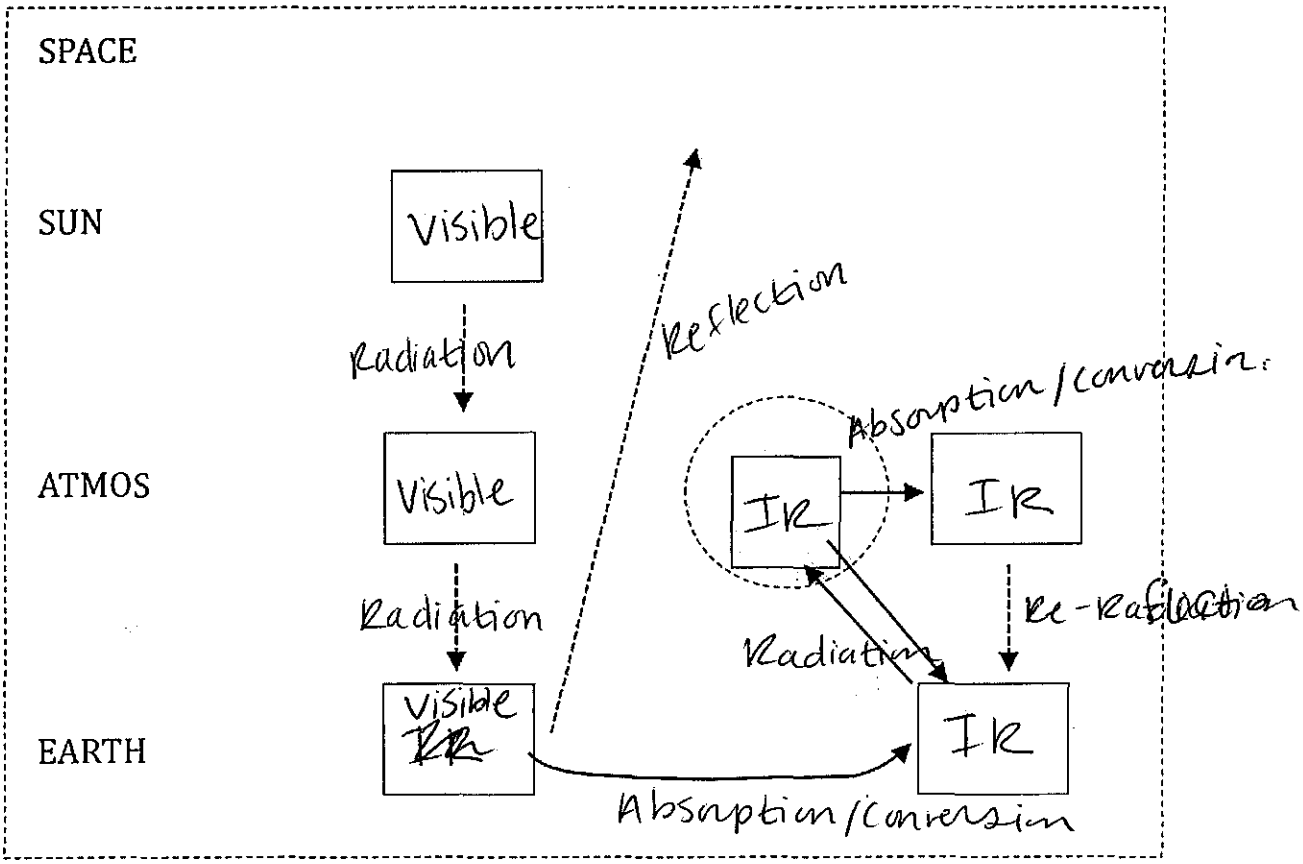
The energy that is absorbed is visible light and leaves as infered.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The energy that is absorbed by greenhouse gas is the energy that is emitted by Earth's surface. They are essentially the same.

C

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



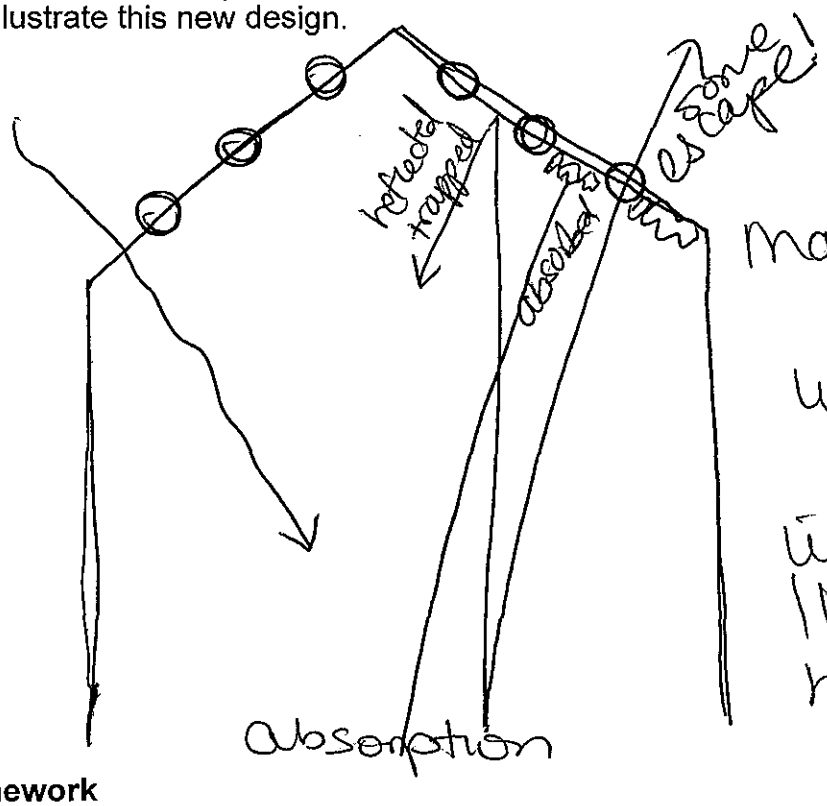
3. Write a complete explanation of the greenhouse effect process in words.

The sun emits visible, UV and IR light. The visible light with its short wavelengths get to the surface and are absorbed and converted into IR longer wavelengths. The IR light, aka heat, is reflected back into the atmosphere where it is absorbed and trapped by the gasses in the atmosphere like CO_2, methane and water molecules. The IR is absorbed and re-reflected back into the surface and space.

C

4. What would happen if the atmosphere contained no greenhouse gases?
The heat would escape because it wouldn't get trapped in the atmosphere – it would not be suitible for human life :

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



make it so some light could escape like the light being reflected into the atmosphere

Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL.**

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

ISP203A – Global Change
Greenhouse Effect

B

Objectives

Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

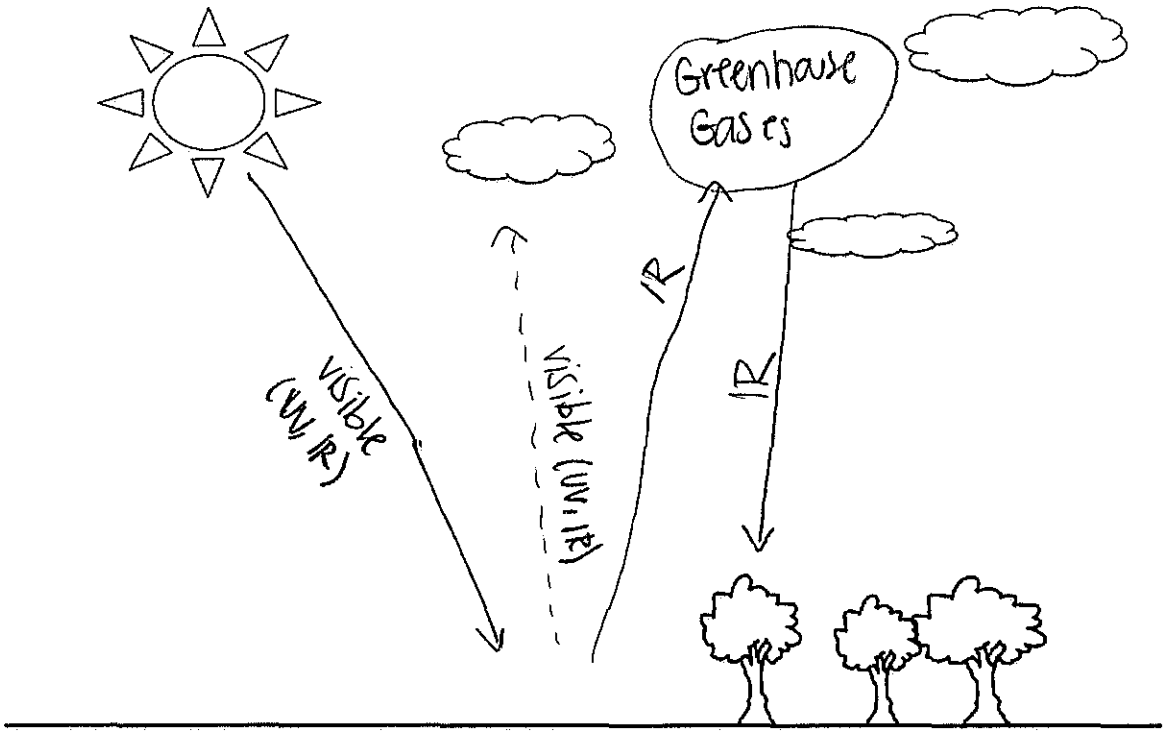
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

B

GROUP #:
Student IDs of Members Present:
A41427286 A40290629
A39703430
A43797704

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

The 3 greenhouse gasses absorb most of the energy that is re-radiated from Earths surface and play a major role in how much heat is radiated back to the surface

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

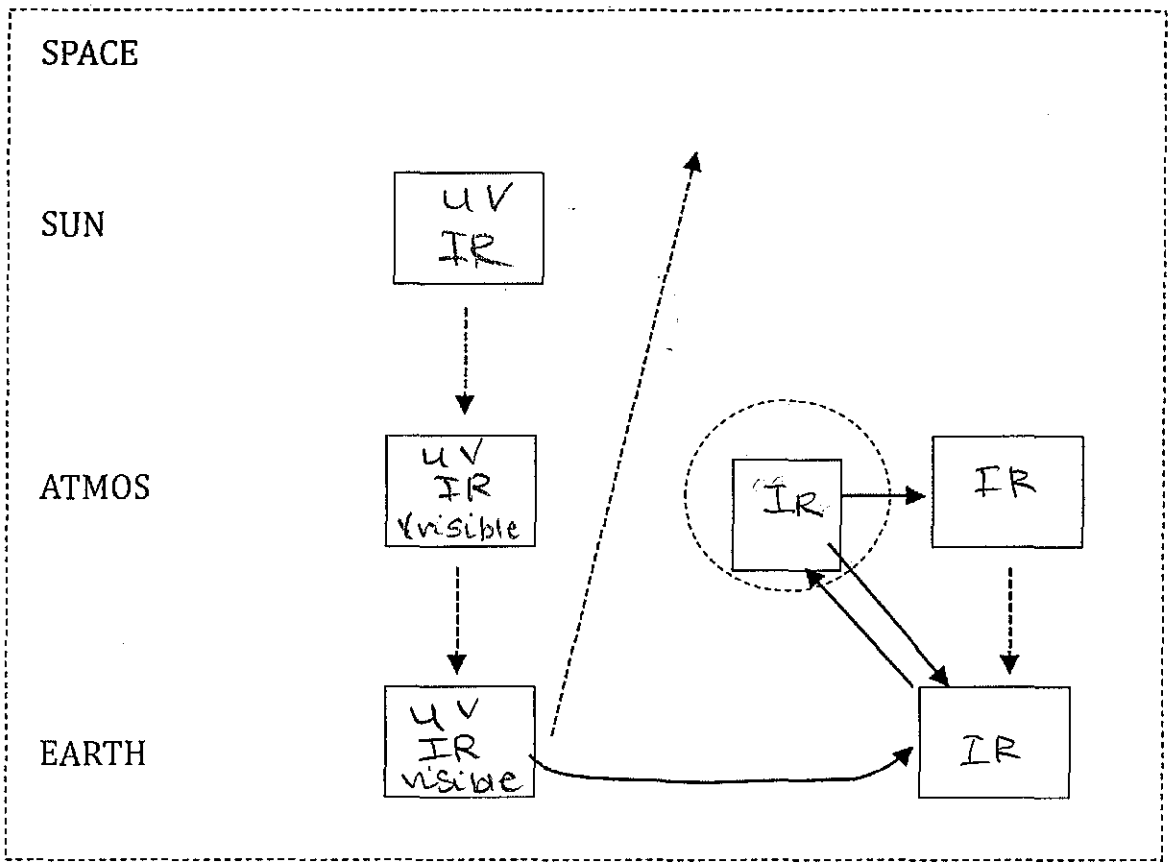
The energy that is absorbed by the surface is similar to the emitted energy in that they both include visible, ultraviolet, and IR light.

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The energy absorbed by greenhouse gasses is different from the energy emitted by the surface because the greenhouse gasse

B

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

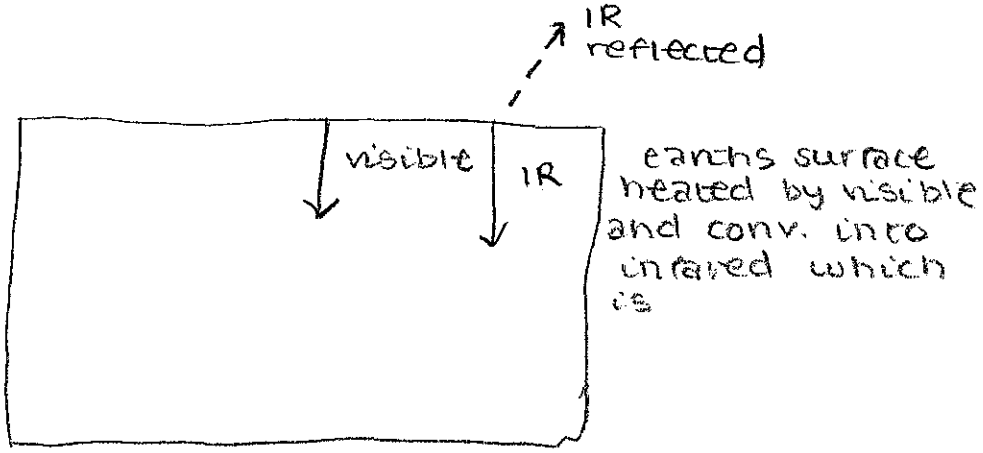
1. Sun radiates energy in the form of ultraviolet rays and infared radiation
2. When light energy reaches the surface it interacts w/ matter (mainly H_2O /land) and is absorbed or re-radiated back into the atmosphere
3. The IR light that is radiated from the surface is absorbed by gasses in atmosphere and re-emit out that IR back toward surface
4. This heat back towards the surface is what allows for humans to exist at appropriate temps for survival.

B

4. What would happen if the atmosphere contained no greenhouse gases?

If the atmosphere had no greenhouse gasses, the light that is radiated by the surface would not be absorbed and re-radiated back to the surface as heat. This would lead to extremely cold temps @ night and extremely hot temps in day on Earth.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



Part 3: Homework

If you complete the group work, you may work on the homework **on your own**. This means your answers should be generally unique from other students' answers. **Submit your homework using ANGEL**.

1. Where would the heat radiated by the Earth go if greenhouse gases did not exist?

2. What would happen to the temperature of the atmosphere if you were to increase the amount of greenhouse gas in the atmosphere?

3. Imagine you were having a conversation with someone who said the greenhouse effect is the cause of global warming. Write a response to this statement that is scientifically correct based on what you have learned in this class and activity.

A

ISP203A – Global Change
Greenhouse Effect

Objectives
Upon completing this activity, you will be able to:

- Explain how natural processes involving greenhouse gases cause warming of the Earth's atmosphere.

Causal Principles

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

5. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.

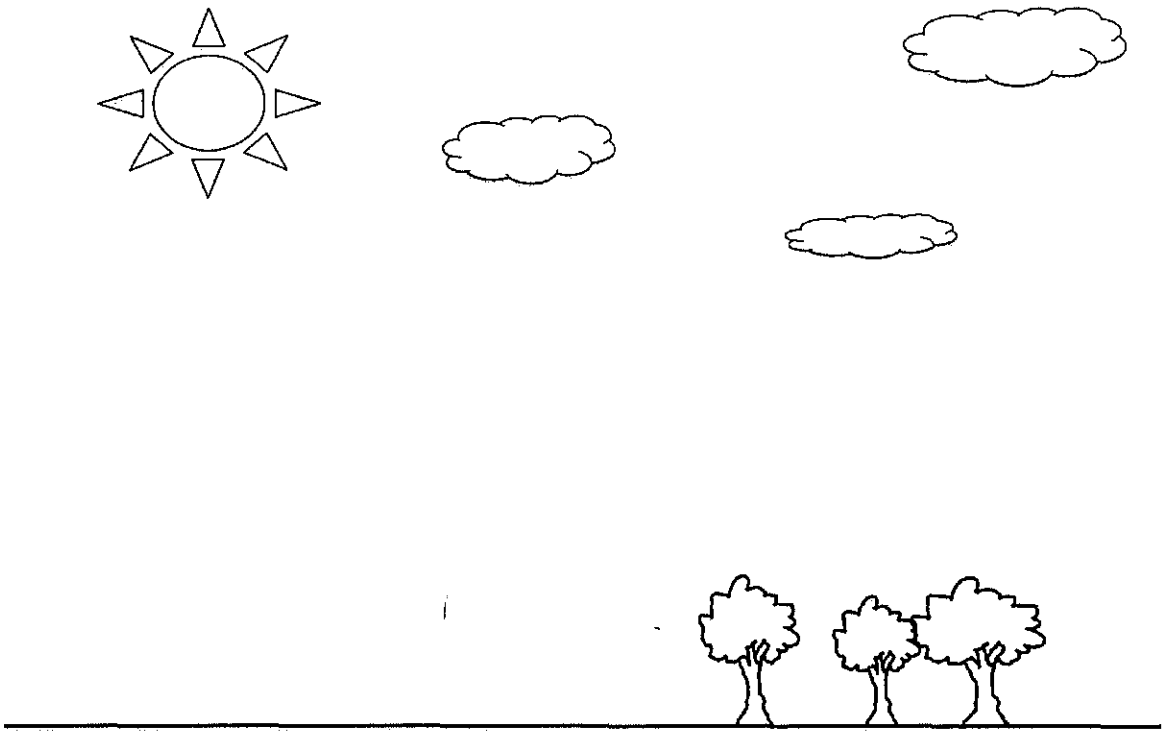
PART 1: Background Notes

ISP203A – Global Change
Greenhouse Effect

A

GROUP #: A
Student IDs of Members Present:
A41749376 A43573450
A41694022 A40246306
A40706302

On the diagram below draw in the features of the greenhouse effect. Label all parts of the greenhouse effect. Use and label arrows to represent processes.



Part 2. Group Work

a. How is energy coming from the Sun similar to or different from the energy that is absorbed by greenhouse gases?

Energy from the Sun has different wavelengths than what is absorbed by greenhouse gases

b. How is the energy that is absorbed by Earth's surface similar to or different from the energy that is emitted by Earth's surface?

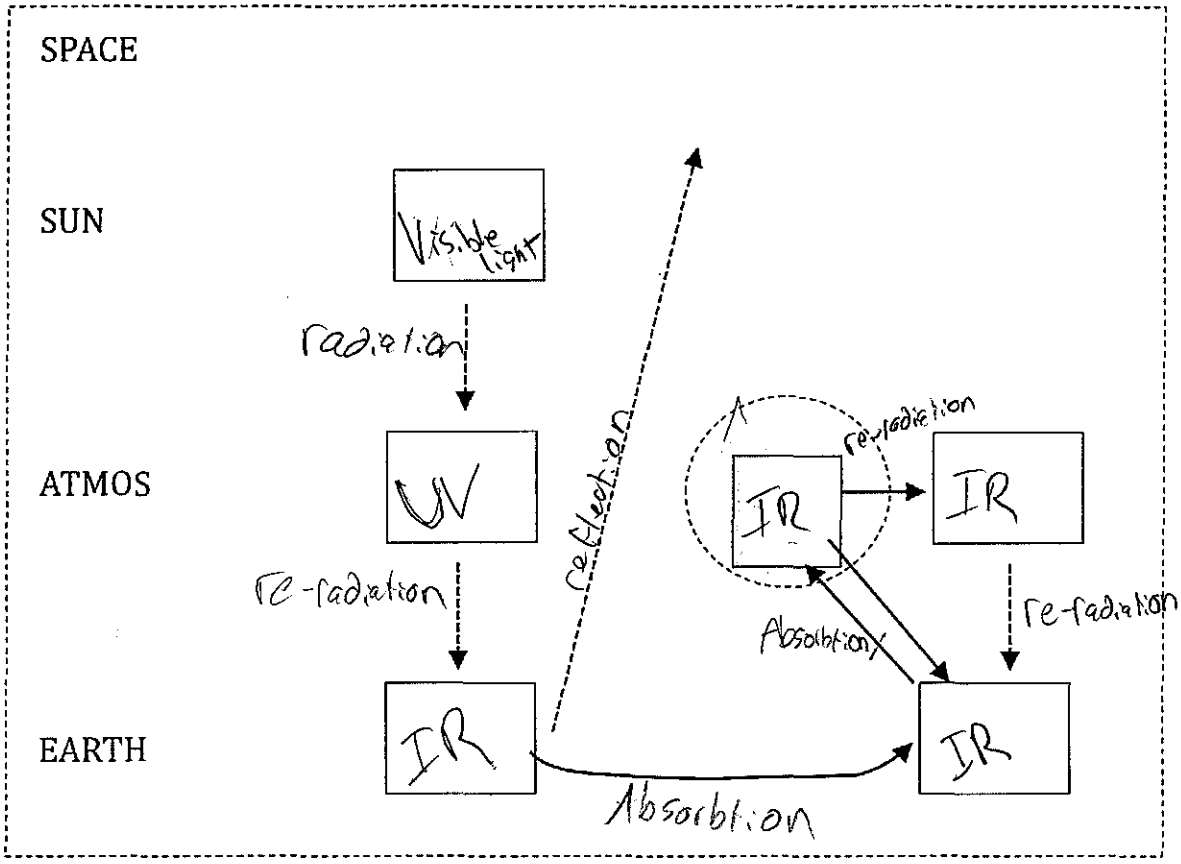
The energy given off is Infared, while the energy absorbed is UV and they have different wavelengths. Energy emitted by earth is changed visible → IR

c. How is the energy that is emitted by Earth's surface similar to or different from the energy that is absorbed by greenhouse gases?

The gases absorb and re-radiate the same energy emitted by earth's surface

A

2. Complete the simple box-and-arrow diagram below.
   - You have all of the boxes and arrows needed to explain the greenhouse effect.
   - In each box, put one of the following: **Visible Light, UV, IR** (Infrared) energy
   - Label each arrow with a process: **Radiation, Absorption/Conversion, Reflection, Re-Radiation**



3. Write a complete explanation of the greenhouse effect process in words.

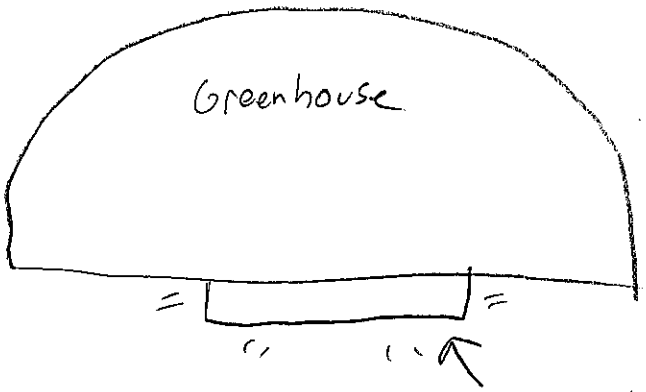
Visible light is sent from the Sun and converted to IR when it is reflected off earths surface, the IR is absorbed and re-radiated from the greenhouse gases

A

4. What would happen if the atmosphere contained no greenhouse gases?

If there were no gases all heat would be lost and it would be very cold, can't survive.

5. How would you redesign a greenhouse to make the warming of the air in the greenhouse a better analog for the process that warms Earth's atmosphere? Draw a diagram to illustrate this new design.



platform that rotates with the Sun absorbing maximum Sunlight

Part 3: Homework

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